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Further Research on Psychological Analyses of Courageous Performances in Military Personnel

S. J. Rachman
University of British Columbia

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Michael Drillings, Acting Director

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The aim of the research was to gain an increased understanding of the nature of courageous performances and the way in which it can be promoted. The practical objective was to develop methods for practicing courageous performances. Military personnel who have to perform hazardous duties were studied before and after training, during operational duties, and under laboratory stress. Various measures were used to asses their behavior, subjective reactions, and psychophysiological responses. The bulk of the research was carried out on military bomb-disposal operators, and supplementary studies were carried out on veterans of the Falklands war and on soldiers undergoing parachute training. The results of the studies include: confirmation of the significant and positive psychological effects of the training procedures, the cumulative effects of operational duty on levels of confidence and skill, the psychological differences between experienced and inexperienced operators, the psychological problems that arise during operations, and the aftereffects of a tour of active duty.

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PSYCHOLOGICAL ANALYSES OF COURAGEOUS PERFORMANCE IN MILITARY PERSONNEL

Principal Investigator: Professor S. Rachman

The purpose of the project was to identify psychological markers of courageous military performance. The study was prospective and involved the collection of data on laboratory stress reactions and personality before bomb-disposal operators of the Royal Army Ordnance Corps went on a tour of operational duty in Northern Ireland. The aim was to predict which operators would perform courageously or at a superior level during their tour of duty.

In addition an extension was initiated late in 1988 in order to test Seligman's hypothesis that an optimistic explanatory style is a pre-condition for courageous performance.

Background

The results of previous research on the subject of fear and courage, reported in the First Project, drew attention to the crucial role of training in the preparation of bomb-disposal operators to perform fearlessly under hazardous conditions. In addition to their lengthy training as Ordnnance soldiers, the operators undergo a two-month course of specialized lectures and demonstrations, followed by a three week course of supervised practical training under realistic conditions. They are required

to render safe a range of devices under realistic simulations based on recent incidents in Northern Ireland. Two separate investigations produced evidence of a small group of exceptionally fearless soldiers, even among this unusually capable and fearless group.

In the second stage, four studies were carried out. A prospective study of the performance of the operators on active duty was completed. Then, an attempt was made to assess the generality of the earlier finding on the role of training in the development of courageous and fearless performance. Thirdly, a psychophysiological analysis of the performance under laboratory stress was expanded to include a fresh sample of military personnel. The fourth part of the research, the precursor of the present study, was an attempt to outline a way to predict the success or failure of the stressful military training.

Courage

The resilience of human beings has been overlooked and as a result most of the prevailing theories of fear must now be regarded as inadequate (Janis, 1951; Rachman, 1978, 1990; Singer, 1981). New analyses and new research are required on this problem and on the nature of courage.

Fearlessness is often regarded as being synonymous with courage, but there is some value in distinguishing this viewpoint from a more elaborate perspective, outlined below. There are several meanings of fear, and similarly, different types of

courage. As well as fearlessness (the absence of fear), we can recognize the occurrence of perseverance despite fear. One could argue that it is this latter type of conduct that is the purest form of courage. It certainly requires greater endurance and effort.

In order to discuss the attributes of courage, one must specify what is meant by fear, but it is no longer sufficient to argue for a single index of, or composite entity of, fear. As argued persuasively in the writings of Lang (1970), "fear is not some hard phenomenal lump that lives inside people, that we may palpate more or less successfully". He proposed instead that we view fear as comprising three major components -- subjective, behavioral and physiological. These three major components of fear are related to each other, but only in an imperfect manner; they are partially independent (Grey, Sartory & Rachman, 1980).

Pursuing this new view of fear, as a complex of imperfectly related components, leads to fresh ideas on the nature of courage. A person may be willing to approach a frightening object or situation but experience a high degree of subjective fear and even some unpleasant bodily reactions. Persistence in the face of these subjective and physical signs of fear is the sort of courage exhibited by many patients. We can now describe this type of courageous behavior as an example of the uncoupling of three major components of fear, in which the person's overt behavior has advanced beyond his subjective discomfort. People who continue to approach the fearful situation without

experiencing either subjective fear or unpleasant bodily reactions are showing a pattern which is more accurately described as being fearless rather than courageous.

These observations, research data from laboratory and clinic, and findings from the literature on military psychology and civilian war-time experiences, led to a fresh analysis of courage (Rachman, 1978; 1990). The following factors are postulated to increase courageous behavior: (a) skill and competence, (b) positive motivation, (c) courageous models, (d) repeated coping practice, (e) self-confidence and (f) situational demands (Gal, 1980).

Although the arguments and evidence presented in Rachman (1990) will not be repeated here, some examples may be helpful. Although fear reactions during or immediately after stress are common, as in air raids, we apparently have the capacity to recover very quickly. Moreover, we have good powers of adaptation to repeated stress and dangers. During air raids, people who were given socially responsible tasks to carry out experienced a growth of courage. Furthermore, it was found that people adapted to air raids and became more courageous with increasing experience - even when, as in London, the raids became progressively heavier.

With respect to the factors which promote courage, procedures for improving ineffective behavior that is caused by fear have yielded clear evidence of the value of coping models in generating fear-reducing behavior (e.g., Bandura and Adams,

1978). People learn from fearless models how to deal with stressful or dangerous situations. Evidence on the courage-inducing value of positive motivation is derived from the literature on military psychology (e.g., Lewis & Engle, 1952). Military surveys also suggest that adequate training and the accompanying sense of competence and self-confidence are important determinants of courageous behavior in combat conditions, and our observations of bomb-disposal officers bear this out (see Reports on First Project). Military evidence, drawn mainly from experience in the Second World War, seems to point consistently towards the proposition that there are in the population numbers of people who are unusually resistant to the acquisition of fear. In some respects, these people appear to resemble those whom Garmezy (1976) has referred to as "invulnerables". The results of the first Project produced two new pieces of evidence in support of this idea.

Military personnel who are particularly resilient when placed in stressful circumstances are of special interest to researchers who seek to understand the origins and nature of courage. In a war-time study of air crews drawn from the 8th USAAF, Hastings, Wright and Glueck (1944) reported on 150 airmen who were particularly successful. Contrary to what had been expected, they found that nearly half of these successful fliers had family histories with emotional instability. Despite this, their life patterns were not marked by social acts but were characterized by "vigour, persistence and physical health". In

the First Project, summarized below, we found that successful (decorated) operators could be distinguished from average operators on the basis of personality characteristics assessed prior to their tour of duty. The former, exceptional group, were particularly calm and clear thinking and no concerned with bodily reactions. In the stress experiment, the decorated operators showed negligible physiological signs of disturbance, relative to successful non-decorated operators or civilians (see also the work of Fenz and Jones, 1972). Apart from the extensive training and preparation which goes in to creating a courageous soldier, it seems possible that exceptional performance under hazardous conditions can be predicted from personality characteristics and/or psychophysiological stability.

Earlier Research

The First Project, conducted on bomb-disposal operators, yielded a number of interesting and potentially valuable findings. These include: confirmation of the significant psychological effects of the training procedures, the cumulative effects of active duty on levels of confidence and skill, the psychological differences between experienced and inexperienced operators, the psychological problems that arise during the tour, the after-effects of a tour of active duty, and so on. In addition, we determined that most operators performed fearlessly on virtually all combat missions, and that during the four month tour of duty, their mood states were stable. A psychometric

analysis of a group of operators who received decorations for gallantry revealed some differences in personality between these soldiers and another highly competent group of operators. The probability that there is a small group of soldiers who are especially capable of carrying out dangerous tasks fearlessly, was strengthened by a psychophysiological study of reactions to stress.

We found some (physiological) differences between decorated operators and non-decorated operators, who were in turn less reactive to stress than civilian control subjects. The potential importance of this group of soldiers, who are physiologically low reactors and unusually healthy, is considerable. Confirmation of the existence of such a group of especially fearless soldiers would allow us to develop methods for identifying these people in advance, and perhaps choosing them for the commission of particularly hazardous missions.

The development of reliable assessment procedures for these soldiers would also put us in a position to monitor the success or otherwise of training techniques designed to increase fearlessness in other groups of soldiers.

Stress Reactions

A distinctive pattern of cardiac response was found in bomb-disposal operators undergoing a laboratory stress test which involves auditory discrimination under threat of electric shock (Cox, Hallam, O'Connor & Rachman, 1983). This result has been

replicated in bomb-disposal personnel (McMillan & Rachman, 1987; O'Connor, Hallam & Rachman, 1985). Bomb-disposal operators who had been decorated for gallantry on duty in Northern Ireland showed lower cardiac responses under a difficult discrimination condition when compared to equally experienced and successful operators who had not been decorated. These groups were also compared on subjective questionnaire reports of anxiety experienced during the laboratory test but consistent differences were not found.

In an attempt to investigate whether or not these findings generalize to a different group of soldiers, the study was repeated on members of the Parachute Regiment who ~~also~~ were veterans of the Falklands War.

As physical fitness can reduce cardiac response to stress (Biersner et al. 1977; Cox et al., 1979; Sinyor et al., 1983) we also tested the hypothesis that heartrate during stress is lower in fitter individuals.

Falklands Replication

The aim of this study was to examine the differences in cardiac response and on subjective anxiety between decorated and non-decorated infantry assault troops who were veterans of the Falklands War. They underwent the standard laboratory stress test that involved difficult auditory discriminations under threat of electric shock, thereby allowing a comparison between these findings with those previously obtained from the bomb-

disposal operators.

The study was designed to closely replicate the study of O'Conner et al (1985). The notable difference in design was the incorporation of a test of physical fitness. However, as this took place following the laboratory stress test, it was unlikely to affect the validity of the replication.

Thirty-four Falklands veterans participated in the study. They were members of the Second Battalion of the Parachute Regiment. Sixteen of these soldiers had been decorated, either for a particular act of bravery or for generally outstanding behavior while on active service in the Falklands. Decorated and non-decorated veterans attended testing sessions in a random order. The average age of decorated veterans was 27.5 +/- 5.57 years (mean +/- standard deviation) and was 23.89 +/- 4.21 years in non-decorated soldiers; this difference was non-significant ($df = 32$, $t = 1.89$, $p < 0.07$). This study took place two years after the Falklands war.

The results replicated the low responsiveness of the decorated soldiers, but this group of assault troops had low responsiveness as a group, regardless of decorations.

THE PRESENT STUDY

In order to identify predictors of courageous performance, psychometric and physiological data were collected from 30 bomb-disposal operators of the RAOC (but the records of one of the operators were not usable because of equipment failure). The

progress and performance of the remaining operators was tracked during their tour of duty.

Of this group, 25 completed a tour of duty of Northern Ireland and it is therefore possible to study the relationship between their performance under laboratory stress and their subsequent behavior in the field. The remaining 4 operators did not serve because of transfers, promotions, etc. Eight of the 25 were decorated for gallantry or received commendations in which they were "mentioned in dispatches" (MID).

Prior to participating in the experimental stress test, each subject filled in two questionnaires: a Bodily Sensation Questionnaire (BSQ) adapted from Borkovec (1975), and a self-rated Retrospective Anxiety Questionnaire (RAQ). This questionnaire had a scale of 0 to 100 (where 0 = totally calm and 100 = maximum level of anxiety). The questionnaire items related to 8 points in the period surrounding the experimental stress test: receiving the requested to attend the experiment, arranging a specific appointment, the morning of the appointment, immediately after the stress test, during the unavoidable shock, after learning how to avoid shock with a lever, during the difficult final phase, immediately after the stress test had finished. The reports of how they felt during the stress test were completed retrospectively (i.e., immediately after the test session had concluded).

After the subjects had completed the initial psychometric tests, and the nature of the test was explained to them, they

were seated in the experimental room. They were told that the experiment was designed to examine reactions to stress and that it would involve the administration of several electric shocks. The subjects' level of shock tolerance was then determined by the administration of brief shocks of increasing strength until a level was obtained for each person which was uncomfortable without being extremely painful.

During the first phase of the stress test, the subjects were asked to sit and listen to the presentation of a series of high and low tones which could be heard through the earphones. In this phase of six trials, they were not required to make any responses and were told that they would receive no shocks.

During the second phase, both high (600Hz) and low (400Hz) tones were each presented on three occasions, but this time they were followed 6s later by the delivery of an electric shock, about which the subjects had been forewarned. On these six trials, the shock was unavoidable. In the final third phase, the CS and the shock were again paired, but the subjects were now able to avoid the shock by moving the lever in one direction for the high tones and in the opposite direction for the low tone. Each subject had to discover through trial and error the correct direction for the two tones. The subjects had 6s in which to move the lever before the shock was delivered. If they made an incorrect decision or if they exceeded the 6s time interval, they received a shock.

During this final phase of the stress test, four sets of six

trials each were administered in turn. In the first six trials, the tones were set at easily discriminable differences (600Hz and 400Hz). Over the following three sets of trials however the discrimination became much more difficult because the lower tone was made progressively higher, changing from 400 to 550, 590 and finally to 600Hz. In the last set of six trials, there was of course no difference between the tones stimuli (i.e., it was an insoluble conflict).

All phases of the experiment were administered to each subject in a single testing session, which lasted for approximately one hour. Subjects were instructed that they could end the experiment at any time if they so wished, but all of them completed the full session.

After the completion of the laboratory tests, subjects were asked to fill in questionnaires once more in order to assess their subjective reactions to the test situation. The Bodily Sensation Questionnaire was completed according to how subjects felt during the most difficult discrimination trials in the final phase of the experiment. The Retrospective Anxiety Questionnaire was used to learn how subjects had felt during the test session itself.

RESULTS

REACTIONS AND BEHAVIOR DURING LABORATORY STRESS

Analysis of the heartrate responses during THE laboratory stress test showed the usual pattern, in which a significant

increase is observed with the introduction of the aversive conflict of choice at phase three of the experiment. As can be seen in Figures Ia, Ib and Ic the general pattern is similar to that recorded in the earlier research described in previous reports of this series.

The heartrate responses of the decorated soldiers were consistently lower than those of the non-decorated soldiers, a trend consistent with earlier results. However, the differences in heartrate responsivity, although consistent, was not significant (see Table 1). Once again, low heartrate responsivity during stress is found to be associated with courageous operational performance, but the distinction between the two groups in this study does not provide a basis for selective prediction.

The subjects' self-rated anxiety during the earliest stages of the laboratory stress test follows the same pattern as the heartrate responses (see Figures IIa, b, c). As in the case of the physiological responses, the self-rated anxiety of the decorated soldiers was consistently lower than that of the non-decorated soldiers. The total amount of anxiety reported by the decorated soldiers (mean 97.1) was significantly lower than that of the non-decorated soldiers (mean 169.7). During the three most difficult points of the laboratory stress test, the self-rated anxiety of the non-decorated soldiers exceeded that of the decorated ones (see Table 2).

The results of the self-reported anxiety during the

completion of the laboratory stress test are consistent with the scores obtained on the BSC (Bodily Symptom Checklist) test, which consists of a list of unpleasant bodily symptoms that the person experienced, prior to the stress test, and during the stress test as reported retrospectively on completion of the task. As in the results of self-rated anxiety during the stress test, the decorated soldiers reported significantly fewer symptoms, and at significantly less intense levels than did the non-decorated soldiers (see Table 3). The results of the BSC distinguished between the decorated and non-decorated soldiers.

Specific examples of the heartrate responsivity and self-rated anxiety during the laboratory stress test of some of the decorated operators are illustrated below. It should be remembered in all this however that numbers of soldiers who showed low heartrate responsivity and reported little anxiety during the stress test did not receive decorations for courageous actions--and it is unknown whether this was through a lack of opportunity. As the soldiers themselves and their officers repeatedly point out, the opportunities for courageous behavior are to some extent a matter of random variation. And it certainly is the case that some of the bomb-disposal operators who carried out their tour of duty in quiet areas may have been called out to deal with only a small number of explosive devices; in sharp contrast, some of the operators in the highly active areas were called out to deal with many dozens of explosive devices. The opportunities for performing courageously varied

considerably. Notwithstanding this qualification, it does appear that soldiers who show low physiological responsiveness and little anxiety during the laboratory stress test show an increased probability of performing courageously under operational conditions.

CLASSIFICATION OF DECORATED VS NON-DECORATED BOMB-DISPOSAL OPERATORS

A discriminant function analysis was performed on the measures obtained from the laboratory stress task in an attempt to separate the decorated from the non-decorated operators. The purpose of the analysis was to obtain the linear combination(s) of these measures which best discriminated decorated from non-decorated bomb-disposal operators. The linear functions are dimensions known as discriminant functions. The predictor variables were the measures of heartrate, number and intensity of bodily sensations, and self-reported anxiety. All of the variables were entered simultaneously into the analysis, provided that they satisfied the tolerance criterion (0.001). All of the 18 variables met this criterion. The subjects were eight decorated and 17 non-decorated operators.

The first discriminant function was found to be marginally significant [$X^2(18)=25.58$, $p<0.11$]. All other discriminant functions were non-significant. These results indicate that only the first discriminant function could distinguish between the decorated and non-decorated group with a probability greater than

chance.

Discriminant function scores were then computed for each subject. This was done by taking the sum of each subject's weighted scores on the 18 predictor variables. The variables were weighted by the unstandardized discriminant function coefficients shown in Table 4, to provide a discriminant function score for each subject. The correlations (loadings) between the discriminant function and each of the predictors are shown in Table 4. These values were uniformly low and so did not reveal any variables that were particularly important in discriminating between the groups. It is the combination of variables rather than any particular one that permits a discrimination.

The mean of the scores on the first discriminant function (group centroid) was -3.193 for the decorated group and 1.503 for the non-decorated group. Using a cutting point that was midway between the centroids (0.845) it was possible to correctly classify 100% of the subjects into their respective groups. As Figure III shows, the first discriminant function was able to clearly separate the groups. However, the marginal significance of the X^2 test, along with the small number of subjects and the low ration of predictors to subjects, raises concerns about the reliability of this function. Although all of the subjects were correctly classified, it remains to be determined whether the function will be of practical value in predicting which operators are likely to receive awards for courageous performance.

PROFILES IN COURAGE

Soldier #28 was awarded a high decoration for courageous behavior during his tour of duty, in the course of which he dealt with an extremely dangerous device despite the considerable risk that was involved. During the course of preparing the data for this report, it turned out that this same operator had received an award for gallantry on an earlier tour of duty. It is therefore of particular interest to look at the psychological profile of this doubly decorated bomb-disposal operator.

As can be seen from Figures IVa and IVb below, during the laboratory stress test, his heartrate basal level was in the range of slightly above 70 and showed only a very slight increase throughout the test. Figure IVb shows that prior to and during the completion of the stress test he reported very little anxiety. His bodily symptom scores were among the lowest recorded. For the period during the stress test, he reported only three symptoms, and these a very low intensity to give a total score of 6.

The next illustration is of an operator who received a similar award for gallantry during operations. Subject #24 showed a stronger heartrate response for a short period during the middle of the stress test (Figure Va). His self-reports of anxiety are remarkable. As can be seen if Figure Vb he reported scant anxiety at any point -- it is virtually a straight line. He reported a mere two bodily symptoms and these were of such a low intensity that his total score was 2.

Next we turn to an operator who twice failed the final part of the specialized training, during the course of which the operators have to deal with a number of realistic mock-up explosive devices, under considerable pressure. Subject #4 had a comparatively high basal heartrate during the laboratory stress test, above 80, and it remained high throughout (Figure VIa). With the exception of the final and most difficult part of the laboratory stress test, he did not report much anxiety. It did, however, peak at this concluding section (Figure VIb). This soldier reported eleven bodily symptoms and had a total score, combining intensity and total number of symptoms of 48.

The next subject, #5, also failed the final part of the specialized training, but his physiological responsiveness and self-reported anxiety during the laboratory stress test were unremarkable (see Figure VIIa and VIIb). On the Bodily Symptoms scale, he reported ten symptoms, and had a total score of 27.

Subject #19 provides a useful illustration of a soldier whose behavior during laboratory stress test was compatible of that of the courageous performers and whose symptoms score was very low, but who did not receive a decoration. This soldier's end-of-tour report was excellent. It can be seen from Figure VIIIa that subject #19 had a low basal heartrate and showed very little change throughout the test. His self-reported anxiety during this stress test was flat except for the introduction of the unavoidable shock during which it briefly rose (Figure VIIIb). He reported two bodily symptoms, and had a total BSQ

score of 3.

The subject who performed extraordinarily well during the laboratory stress test, #13, had a low basal heartrate and showed almost no change even during the most difficult part of the test (Figure IXa). As can be seen from Figure IXb, he reported no anxiety at any time. His BSQ score was 3. Although this soldier did not receive a decoration for gallantry, his end-of-tour report was also extremely flattering, and the superior officer who completed the report spontaneously remarked how calm he had been during operations.

Turning next to an operator with a poor end-of-tour report from his superior officer, who observed signs of considerable anxiety at various stages during operational tour, subject #11 had an extremely high basal heartrate, nearly 90, and it remained high throughout (see Figure Xa). His self-rated anxiety started out at the comparatively low level of 20 but rapidly rose immediately before the stress test to 60 and as high as 80 during the test itself (Figure Xb). He reported no less than 19 bodily symptoms and had a total BSQ score of 100 (by far the highest in the entire sample).

The next subject, #16, had an end-of-tour report that was below average. During the laboratory stress test he started with a comparatively low basal heartrate, but this rapidly rose to 90 during stress and then slowly declined back to its original level (see Figure XIa). As can be seen from Figure XIb however, his self-reported anxiety was extremely high and showed three

distinct peaks, almost reaching a maximum on two occasions during the test itself. Subject #16 reported 13 bodily symptoms, and had a total BSQ score of 65.

None of the profiles of the decorated soldiers gave indications of excessive heartrate responsivity, high levels of self-rated anxiety, or many or intense bodily symptoms. Some of the very few failures had fairly responsive records however, and soldiers who had below average end-of-tour reports tended to have more responsive profiles than did the rest of the soldiers. It must be remembered that some of the soldiers who had remarkably non-responsive heartrate reactions and virtually no anxiety during the laboratory stress received better than average end-of-tour reports, but did not receive an award for gallantry.

The heartrate responses, and self-rated anxiety, during the laboratory stress test for each of the soldiers are illustrated in the figures reproduced in the Appendix.

THE INTER-RELATION BETWEEN MEASURES

The relations between the three sets of measures -- heartrate responses, self-rated anxiety, and bodily symptom reports -- are shown in the correlation matrix (Table 5).

As is to be expected, the total number of bodily symptoms reported is highly correlated with the intensity of the symptoms, and this relationship was present both before and after the completion of the laboratory stress test. The correlations

between number and intensity of symptoms exceeded 0.8, and the inter-relationship between pre- and post-scores was also highly significant at greater than 0.6.

The inter-relations between the self-reported levels of anxiety were also high and significant throughout as is to be expected. Likewise, the inter-correlations between the heartrate responses prior to, during, and after the stress test, were also high and invariably significant.

There was, however, only a small and non-significant relationship between heartrate responses and self-rated anxiety, and between heartrate responsiveness and bodily symptoms (mostly in the range of 0.1 to 0.2, all non-significant).

There was, however, a low positive correlation between the number and intensity of bodily symptoms reported and the amount of anxiety experienced during the stress test. In the early phases of the stress test, the correlation between self-reported anxiety and the total bodily symptoms score was in the region of 0.2, rising in the most stressful latter part of the stress test to 0.6 and above, significant at the 0.001 level.

As in the earlier research, the correlations between the soldiers' self-reported anxiety and the number and intensity of the physical symptoms which they experienced was consistently positive, and often reached a statistically significant level of association. The relation between self-rated anxiety and heartrate responsiveness, as in earlier research, was consistently positive but in the low range and seldom reached

significance. Similarly, the relationship between heartrate responsiveness and bodily symptoms report was low and usually non-significant.

END-OF-TOUR REPORTS

Whenever an operator completed a tour of operational duty we obtained from his superior officer an end-of-tour report which consisted of a scale constructed specifically for this purpose. In addition to obtaining information about the operator's placement and the level of activity, we asked the superior to rate the soldier's anxiety on four separate scales. These were: anxiety displayed while dealing with an explosive devise, the peak amount of anxiety displayed during such an operation, the amount of anxiety displayed between tasks, and the level of anxiety for the entire period of the tour. The overall results are shown in Table 6 below.

The clear and remarkable outcome of this exercise is how little anxiety was observed among the entire group of operators (n=25) on this scale. For the total group, they obtained a total rating of 86 out of 100 on calmness (where 100 equals completely calm), for the period of their operational duty as bomb-disposal operators! Even among this remarkably calm group, the 8 decorated soldiers had a higher mean, of no less than 95 out of 100. Remarkably little anxiety was displayed while dealing with explosive devices. The group had a mean of 12 out of 100, on a scale on which 100 equals maximum anxiety and 0 equals no anxiety

whatsoever. Once again the group of decorated operators had a lower mean of 5 out of 100.

On the rating of unacceptable level of anxiety while dealing with an explosive device, on a scale on which 0 equals never and 100 equals always, only two operators from the entire group were reported ever to have shown unacceptable levels. None of the decorated operators was ever observed to show an unacceptable level of anxiety. As to anxiety displayed between tasks, the mean for the entire group was very low, with a mean of 5.5 on a scale of 0 (equals no anxiety) to 100 (which would indicate extreme anxiety). The decorated operators had a mean of 2!

Looking at these results in another way, 60% of the total group never displayed anxiety while dealing with an explosive device, 92% of them never displayed unacceptable anxiety at any point while on a task, and 66% never showed any significant anxiety between tasks -- an altogether remarkable display of calm performance of a hazardous duty. Even among this remarkably calm group, the decorated operators managed to display lower means of anxiety than the remainder. However, as the mean levels of anxiety displayed by the non-decorated operators was so low, the differences between the decorated and non-decorated operators, while consistent, failed to reach statistical significance.

SUMMARY

These 25 operators performed extremely well on operational duty and were rated as displaying only negligible anxiety on

tasks and between tasks. Given such remarkable behaviour for the group as a whole, the success of the discriminant function analysis in dividing off the decorated from the non-decorated operators in terms of their performance during the laboratory stress test is an achievement.

EXPLANATORY STYLE AND COURAGEOUS BEHAVIOR

In view of the significant advances made in understanding the nature of explanatory styles, it was decided to investigate the implications of this work for the study of courage. In collaboration with the author of this work on explanatory style, Professor Seligman, it was deduced that an optimistic explanatory style facilitates courageous behavior.

People who explain unfortunate events by unstable, specific and external causes (e.g., it will go away quickly, it is an isolated problem and it is not my fault) show higher achievement, more resilience after defeat and less depression. On the basis of these findings it was hypothesized that pessimistic people are less likely to perform courageously than those people with an optimistic explanatory style.

The central feature of the general model underlying this hypothesis is that a pessimistic explanatory style predisposes people to the symptoms of depression and that as a consequence of depression, courageous behavior is undermined or made less probable. Depression reduces voluntary response initiation and thus vitiates a major precondition for courage. The evidence for

response initiation variations is summarized by Petersen and Seligman (1987). The main proposition is that if a person habitually sees internal, stable and global causes for bad events, then he or she will tend to become depressed when bad events occur at a later time. The evidence supporting this proposition is drawn from cross-sectional correlational studies, longitudinal data, experiments of nature and laboratory studies. The evidence converges to show that a pessimistic explanatory style leads to symptoms of depression when bad events are encountered. In most of these studies, explanatory style was assessed by means of the Attributional Style Questionnaire (ASQ).

This self-report instrument provides explanation for good and bad events with internal versus external, stable versus unstable, and global versus specific causes. The format is designed to assert how much the respondents use each of these three dimensions when accounting for important events. The subjects are asked to generate their own cause or explanation for each of a number of different events, and then to rate that cause along a 7-point scale corresponding to stability, internality, and globality. The ASQ does not constrain or create the causal explanations provided by the subject, but at the same time, it provides simple and objective quantification of those responses by asking the subjects to rate of these three dimensions. Three major scores are derived from the ASQ. The first, CPCM consists of the full scale score in which the total of the negative scores is subtracted from the positive. A separate calculation is made

for the composite negative score, and the third is the composite score for positive and negative events (CSPN). The manner in which the questionnaire has been used and the main results have been written by Sweeney (1986) who reviewed 104 studies involving 15,000 subjects. In addition to substantive findings from this research, it has been demonstrated that the instrument itself is reliable and valid and it was therefore chosen for the present study.

A supplementary method of assessing causal explanations has been developed to deal with those situations in which the subject is unable to complete the questionnaire or is inaccessible. It is particularly useful for determining the explanatory style of public or historical figures. The CAVE technique enables one to derive causal explanations from verbatim material, including interviews. Firstly, the causal explanations are identified by the researchers reading or listening to the verbatim material. Once an event is located, the assessor looks for an attributed factor that from the perspective of the subject has caused that event. Sometimes the causes are clear, such as "because of this" and so on, but at other times the causal explanation has to be inferred. Using the methods developed by Seligman and his colleagues, independent judges agree more than 90% of the time about the causal explanations in the material (Peterson, Bette, Seligman, 1986).

As the theory and research on the subject of explanatory style is advanced and of growing significance we felt an attempt

to apply these ideas to the study of courage was justified. A successful application would help to expand our understanding of courage and importantly, connect it to a large a growing body of scientific psychology. In addition to the importance and plausibility, the explanatory style model is supported by reliable and established measuring instruments, particularly the ASQ.

It was therefore decided to use the ASQ as the main method for determining explanatory style among soldiers who have or who have not received decorations for courageous behavior. In order to obtain even richer material, and to double check on the findings, it was decided to carry out detailed interviews with a subsample of the soldiers in order to derive independent measures of their explanatory styles and then to relate this to their courageous behavior.

It should be mentioned however that there is at least one snag in applying this work to the study of courage. The original hypothesis, linking courageous behavior and voluntary response initiation, seems not to provide all those important examples of courageous behavior in which there is no overt evidence of response initiation. Rather, the act of courage consists of defiance, even passive defiance (see Rachman, 1990).

In the present study, attention was confined to the main hypothesis: Soldiers who have an optimistic explanatory style show more courageous behavior than soldiers with a pessimistic explanatory style.

Method

In order to test this hypothesis, we obtained ASQ scores from as many of the original bomb-disposal group as were available (n=17). In order to increase the number of courageous people in the sample, we added a number of bomb-disposal operators who had received decorations for courageous behavior, but who were not members of the original study group. A group of 6 decorated members of the Parachute Regiment were also included in order to boost the sample size.

The ASQ results were supplemented by 14 standardized interviews carried out by the Principal Investigator on bomb-disposal operators from the original group and 4 others from the same vintage but who were not included in the original prospective study. The interviews followed a standardized pattern, covering three main areas.

Results

The interim results, based on 13 bomb-disposal operators, were described in an earlier report. The total scores derived from the Attributional Style Questionnaire, ranged from a high of 8.3 (highly positive, optimistic) to -1 (indicative of a more pessimistic outlook). Using a cut-off score derived from the original standardization of the scale, six of the operators had an above average CPCN score of greater than 5, and five had scores below 1.17. As can be seen from Table 7 the soldiers with

the high scores had above average end-of-tour reports from their superior officers, whereas two of the soldiers with low scores received low reports and only one had an above average tour. As noted at the time of the earlier Report, these results were encouraging, but no more than that.

The complete results from 30 soldiers, bomb-disposal operators and members of the Parachute Regiment, are shown in Tables 8, 9, 10 and 11. By including the members of the Parachute Regiment, it was possible to bring the total number of soldiers who received decorations for courageous behavior up to 15, making comparisons between the two groups possible.

The comparisons between the decorated and non-decorated soldiers failed to produce any significant differences. The two groups were not significantly different on their total CPCN scores, nor on their composite negative score (CNEG), or on the composite score for positive events (CSPE). Examinations of the distribution of scores shows that the bunching at the high CPCM end of the scale that was observed in the interim report was diluted by four decorated soldiers who scored at the low end of the scale. Two of them obtained negative scores on the CPCM. When the soldiers were ranked by the size of their negative attributions, the four soldiers with the highest negative scores were also from the decorated group. Of the three distributions, the only one that is somewhat consistent with the hypothesis is the rank ordering of the soldiers by the composite positive scores. Here, the majority of the decorated soldiers were in the

upper level of positive scores, and all but two of them scored 13.3 or higher.

The assessment of attributional style by standardized questionnaire was supplemented by a series of interviews. Fourteen soldiers, 7 of whom received decorations, were interviewed by the Principal Investigator using a standardized format, which generally took about one hour to complete. The interview covered three main areas: present life and outlook with recent examples of significant events and how they were interpreted; a retrospective analysis of the person's military experiences; and the subject's account of significant positive and negative events recalled from childhood. Two blind assessors used the CAVE method of analysis in order to classify the subjects into positive or negative attributional style on the basis of the recorded interviews. The blind interviewers had a high level of agreement, eleven out of fourteen, and the three subjects on whom they could not agree were discarded. Of the 11 soldiers whose interviews were consistently classified, 8 fell into the positive group, 2 into the negative group and one on the border of these two categories. Four of the decorated soldiers fell into the positive category and one into the negative attributional category. Three of the non-decorated soldiers fell into the positive category, one into negative and one on the border between positive and negative.

There was a good correspondence between the classifications based on the interview material and the scores received by the

subjects from the ASQ. Sub-analyses of the ASQ scores in which the results of the bomb-disposal operators and those of the members of the Parachute Regiment were examined separately produced an outcome that was closely similar to the results obtained form the total group of 30 soldiers.

Discussion of ASQ Results

The results of the ASQ tests do not support the hypothesis. The composite score of positive and negative attributions was not different for the decorated and non-decorated soldiers. The separate scores for the positive attributions and for the negative attributions also failed to distinguish between the two groups. Moreover, the classifications into optimistic and pessimistic explanatory style that were based on the interview material did not correspond to the decorated and non-decorated categories.

Given that the hypothesis specified the importance of a positive explanatory style, the key measure should be the composite score for positive attributions. One possibility for the absence of a difference in the positive explanatory style scores between the decorated and non-decorated soldiers is that they all come from the same distinctive group, and that to search for differences within a highly positive group is perhaps doomed to failure. We therefore compared the mean composite positive scores for the operators with those of a recently accumulated results taken from a group of American students (Seligman,

personal communication). The composite mean score for this group was 15.87 with a standard deviation of 2.03. The mean score for the soldiers was 14.16 with a standard deviation of 2.02. Hence the absence of the difference between the decorated and non-decorated soldiers cannot be accounted for by a restricted range of explanatory styles.

Furthermore, two of the decorated soldiers had negative CPCM scores (that is, the composite of positive and negative explanatory attributions). Given that the hypothesis states that optimism is a pre-condition for voluntary response initiation and hence for courageous behavior, the results for these two soldiers run contrary to the expectation. To make matters worse, the four soldiers with the highest negative attributional scores, 14.50 and above, were all in the decorated group. Two of the four soldiers with the lowest positive scores, less than 12.50, were decorated.

It is clear that the hypothesis receives no support from these data. Neither the composite score which combines positive and negative attributions, nor the positive and negative attribution scored separately, distinguish the decorated from the non-decorated soldiers. Furthermore, even soldiers with pessimistic explanatory styles and those with low positive attributional style, are capable of courageous performance, and some of them indeed were decorated for just such behavior.

The only remaining possibility would appear to be an association between an extremely pessimistic explanatory style

and the low likelihood of behaving courageously. That is, people who have an explanatory style which places them in the potentially or actively depressive range, are less likely to perform courageously than are other people. In order to test this possibility, research will have to be carried out on a clinical or subclinical population, and that would exclude an investigation of the type of courageous behavior that is the subject of the present study. Before embarking on such a study, it would be well to remember that even persistently timid or very frightened people are capable of behaving courageously in some circumstances (see Rachman, 1978, 1990).

CONCLUSIONS

The operators who went on to receive decorations for courageous performance showed low heartrate responsiveness and low anxiety during the laboratory stress test -- consistent with the earlier studies in this program of research. Notwithstanding the low responsiveness of the non-decorated operators, on a discriminant function analysis, all of the decorated operators were correctly classified. The main differences between the groups were on scores of self-reported anxiety and bodily sensations, not on heartrate responsivenes. On the basis of the stress test, most of the operators would be capable of performing hazardous duties, and it is possible that by using a combination of subjective and physiological responses, we may be able to refine our predictions even to the point of selecting those

soldiers most capable of performing courageously.

The application of attributional style theory was not successful and the specific hypothesis, that soldiers with a positive explanatory style are more likely to perform courageously, was not supported.

Before turning to a consideration of the practical implications of the results of the succession of studies, some general observations are in order. The most striking outcome of these studies is the remarkable competence and calmness of the operators. They repeatedly carried out difficult and exceedingly dangerous tasks, with consummate success and negligible psychological disturbance.

Three factors appear to play a part in producing this remarkable performance: excellent training, cohesive small group cooperation and personal resilience. The evidence of their calm competence under operational conditions and of their low responsiveness under laboratory stress are at one in confirming their resilience. Moreover, even within this group of calmly competent operators there is an identifiable sub-group of supra-calm operators. Members of this sub-group collected between them a large number of decorations for bravery. By combining measures of their subjective and physiological reactions under laboratory stress it is possible correctly to classify these soldiers--and this opens the door to a means of predicting which members of this skilled and calm group are most likely to carry out hazardous duties with conspicuous success.

For practical purposes, such predictions in this group of RAOC bomb-disposal operators would however add little to their opeational success--the general level of performance of the entire group is so high and the failures so rare, that there is no need to seek improved predictability. The results of the research do however provide a good basis for developing psychological tests capable of predicting success in the performance of other forms of hazardous duties.

As for our understanding of the nature of courage, the research results are most encouraging in their demonstration of consistently fearless conduct even in the face of great danger. The results also confirm the value of thorough and realistic training, and the power of cohesive small operational groupings. Lastly, it has been possible to identify the existence of a small group of people who show minimal responsiveness to stress and exceptional resilience in the performance of extremely hazardous tasks.

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Table No.1 -- Heart Rate Means During Stress Test

	Decorated (n=8)	Non-Decorated (n=17)	
HR1	74.5 (5.9)	77.2 (11.0)	NS
HR2	74.25 (7.6)	76.6 (11.3)	NS
HR3	79.1 (9.7)	80.2 (10.1)	NS
HR4	76.4 (8.3)	79.2 (9.5)	NS
HR5	74.9 (6.9)	76.5 (9.4)	NS
HR6	74.4 (5.5)	75.3 (9.5)	NS

Table No.2 -- Self-Rated Anxiety at Each of Eight Phases of the Stress Test

	Decorated (n=8)	Non-Decorated (n=17)	
ANX1	15.3 (17.5)	11.9 (15.8)	NS
ANX2	8.0 (6.0)	10.5 (13.2)	NS
ANX3	10.9 (8.0)	21.4 (23.7)	NS
ANX4	19.1 (15.1)	25.0 (22.0)	NS
ANX5	19.6 (17.3)	38.5 (25.0)	.041
ANX6	7.0 (6.1)	21.3 (21.7)	.021
ANX7	13.4 (192.)	34.6 (26.6)	.035
ANX8	5.1 (6.7)	6.5 (11.3)	NS
TOTANX	97.1 (66.4)	169.7 (130.5)	.079

Table No. 2a. -- Self-Rated Anxiety During the Eight Phases of the Stress Test

	Total Sample (n=25)	Lo-Reactors (n=12)	Hi-Reactors (n=13)
ANX1	13	4.2	21.2
ANX2	9.7	3.8	15.2
ANX3	18.0	7.6	27.6
ANX4	23.1	8.1	37
ANX5	32.4	17.3	46.5
ANX6	16.7	5.7	26.9
ANX7	27.8	8.8	45.5
ANX8	6.1	2.1	9.8

Table No.3 -- Total Symptom Scores and Number of Symptoms, Pre- and Post-Test

	Decorated (n=8)	Non-Decorated (n=17)	
TotSym (pre)	15.3 (17.5)	11.9 (15.8)	NS
NumSym (pre)	5.1 (3.1)	6.2 (6.1)	NS
TotSym (post)	14.3 (14.1)	28.9 (25.1)	.07
NumSym (post)	5.1 (2.6)	7.6 (4.2)	.08

Table 4: Unstandardized coefficients and loadings for the first discriminant function.

Predictor	Unstandardized coefficient	Loading
HR1	.365	.063
HR2	-.234	.049
HR3	-.493	.024
HR4	.633	.068
HR5	.771	.040
HR6	-1.009	.023
Pre. tot. body Sx	-.035	.064
Pre. no. body Sx	-.110	.044
Post tot. body Sx	.139	.140
Post no. body Sx	-.186	.140
Anx1	-.033	-.043
Anx2	.116	.046
Anx3	.001	.110
Anx4	-.173	.062
Anx5	.084	.175
Anx6	.033	.165
Anx7	-.002	.184
Anx8	-.113	.030

TABLE 5

Pearson Correlations

The variable headings used for the correlations reported on the following two pages are in abbreviation form. The complete headings, with their abbreviated versions are listed below.

PRE BODILY SYMPTOMS TOTAL.....PRETOTB
PRE NO BODILY SYMPTOMS.....PRENOB
POST BODILY SYMPTOMS TOTAL.....PSTTOTB
POST NO BODILY SYMPTOMS.....PSTNOB
ANXIETY SCORE POINT 1.....ANX1
ANXIETY SCORE POINT 2.....ANX2
ANXIETY SCORE POINT 3.....ANX3
ANXIETY SCORE POINT 4.....ANX4
ANXIETY SCORE POINT 5.....ANX5
ANXIETY SCORE POINT 6.....ANX6
ANXIETY SCORE POINT 7.....ANX7
ANXIETY SCORE POINT 8.....ANX8
TOTAL ANXIETY.....TOTANX
HEART RATE SCORE POINT 1.....HR1
HEART RATE SCORE POINT 2.....HR2
HEART RATE SCORE POINT 3.....HR3
HEART RATE SCORE POINT 4.....HR4
HEART RATE SCORE POINT 5.....HR5
HEART RATE SCORE POINT 6.....HR6

TABLE 5

PEARSON CORRELATION TABLE

	PRETOTB	PRENOB	PSTTOTB	PSTNOB	ANX1	ANX2
PRENOB	.89 ***					
PSTTOTB	.65 ***	.66 ***				
PSTNOB	.60 ***	.59 ***	.85 ***			
ANX1	-.05 n.s.	-.02 n.s.	.19 n.s.	.17 n.s.		
ANX2	-.02 n.s.	.00 n.s.	.12 n.s.	.15 n.s.	.79 ***	
ANX3	.19 n.s.	.24 n.s.	.34 *	.40 *	.47 **	.64 ***
ANX4	.39 *	.46 **	.54 ***	.49 **	.20 n.s.	.22 n.s.
ANX5	.29 n.s.	.29 n.s.	.68 ***	.56 ***	.32 *	.34 *
ANX6	.30 n.s.	.30 n.s.	.64 ***	.62 ***	.14 n.s.	.15 n.s.
ANX7	.26 n.s.	.24 n.s.	.71 ***	.65 ***	.24 n.s.	.23 n.s.
ANX8	.38 *	.50 **	.78 ***	.58 ***	.25 n.s.	.24 n.s.
TOTANX	.29 n.s.	.33 *	.68 ***	.62 ***	.57 ***	.60 ***
HR1	.29 n.s.	.27 n.s.	.22 n.s.	.21 n.s.	.06 n.s.	.10 n.s.
HR2	.27 n.s.	.21 n.s.	.21 n.s.	.21 n.s.	.15 n.s.	.21 n.s.
HR3	.13 n.s.	.06 n.s.	.20 n.s.	.20 n.s.	.29 n.s.	.21 n.s.
HR4	.25 n.s.	.19 n.s.	.22 n.s.	.24 n.s.	.28 n.s.	.23 n.s.
HR5	.29 n.s.	.26 n.s.	.23 n.s.	.23 n.s.	.24 n.s.	.24 n.s.
HR6	.32 *	.29 n.s.	.28 n.s.	.28 n.s.	.22 n.s.	.19 n.s.

* = $P < 0.05$
** = $P < 0.01$
*** = $P < 0.001$
n.s. = non significant correlation
n = 29

TABLE 5

PEARSON CORRELATION TABLE

	ANX3	ANX4	ANX5	ANX6	ANX7	ANX8
ANX4	.71 ***					
ANX5	.53 **	.63 ***				
ANX6	.46 **	.46 **	.70 ***			
ANX7	.45 **	.55 ***	.80 ***	.81 ***		
ANX8	.31 n.s.	.50 **	.65 ***	.59 ***	.59 ***	
TOTANX	.79 ***	.74 ***	.87 ***	.75 ***	.82 ***	.67 ***
HR1	.21 n.s.	.21 n.s.	.10 n.s.	.07 n.s.	.11 n.s.	.16 n.s.
HR2	.19 n.s.	.10 n.s.	.17 n.s.	-.01 n.s.	.09 n.s.	.09 n.s.
HR3	.25 n.s.	.09 n.s.	.21 n.s.	.25 n.s.	.17 n.s.	.11 n.s.
HR4	.28 n.s.	.20 n.s.	.26 n.s.	.17 n.s.	.20 n.s.	.10 n.s.
HR5	.26 n.s.	.21 n.s.	.28 n.s.	.11 n.s.	.14 n.s.	.15 n.s.
HR6	.22 n.s.	.18 n.s.	.27 n.s.	.11 n.s.	.16 n.s.	.17 n.s.

	TOTANX	HR1	HR2	HR3	HR4	HR5
HR1	.17 n.s.					
HR2	.17 n.s.	.90 ***				
HR3	.27 n.s.	.78 ***	.83 ***			
HR4	.31 n.s.	.85 ***	.92 ***	.93 ***		
HR5	.28 n.s.	.85 ***	.95 ***	.86 ***	.95 ***	
HR6	.26 n.s.	.87 ***	.95 ***	.84 ***	.94 ***	.97 ***

* = $P < 0.05$
** = $P < 0.01$
*** = $P < 0.001$
n.s. = non significant correlation
n = 29

Table No.6 -- End-of-Tour Reports

	Calmness on Tour (0-100)	Anxiety on Task (0-100)	Peak Anxiety (0-100)	Anxiety between Tasks (0-100)
Group Mean	86	12	4	6.5
Decorated Operators	95	5	0	2

Table No. 7

(T.2.) CPCN Scores and End-of-Tour Report Grading (n = 13)

6 soldiers with CPCN above 5

Subject No.	Initial	Grade
2	T	Excellent, especially calm
4	WO T	Below average
6	R	To come
9	E	Decorated for bravery
11	Mc	Above average
13	B	To come

5 soldiers with CPCN below 1.17

Subject No.	Initial	Grade
3	J	Above average
5	S	Below average
7	S	To come
8	B	Below average
10	C	Average

2 soldiers with CPCN between

Subject No.	Initial	Grade
1	T	Failed
12	C	Average

Table No.8 — ASQ Means

	Decorated (n=10)	Non-Decorated (n = 14)	
CPCN (pos-neg)	3.35 (2.87)	1.89 (2.5)	NS
CONEG (neg)	11.75 (2.97)	11.85 (1.78)	NS
COPOS (pos)	15.10 (2.92)	13.74 (1.88)	NS

Table No.9 -- Thirty Soldiers Ranked by CPCNB Scores
(* = Decorated)

Name	CPCNB	CNEGB	CPOSB
NM*	5.83	9.50	15.33
ED*	5.33	8.00	13.33
S10*	5.00	13.00	18.00
CH	5.00	10.83	15.83
s7	4.67	11.00	15.67
s13	3.83	12.50	16.33
s14*	3.67	11.83	15.50
Far	3.33	13.50	16.83
s12	3.33	12.17	15.50
s5	3.00	10.33	13.33
s9	2.83	11.83	14.67
s16*	2.50	11.00	13.50
s4*	2.00	13.50	15.50
s8	2.00	11.33	13.33
s15*	1.83	14.50	16.33
Fr*	1.67	12.67	14.33
SC	1.33	10.67	12.00
FR	1.00	11.50	12.50
BR*	1.00	15.50	16.50
s11*	1.00	11.33	12.33
MR*	0.83	7.33	8.17
CH	0.67	11.83	12.50
AB*	0.67	13.17	13.83
CN*	0.50	14.83	15.33
s1	0.33	12.83	13.17
s2	0.00	13.17	13.17
HS	-0.17	13.17	13.00
s3*	-0.50	13.83	13.33
KL	-1.17	11.50	10.33
s6*	-1.33	16.50	15.17

Table No.10 -- Thirty Soldiers Ranked by CPOSB Scores
(* = Decorated)

Name	CPCNB	CNEGB	CPOSB
s10*	5.00	13.00	18.00
Fa	3.33	13.50	16.83
BR*	1.00	15.50	16.50
s15*	1.83	14.50	16.33
s13	3.83	12.50	16.33
CH	5.00	10.83	15.83
s7	4.67	11.00	15.67
s14*	3.67	11.83	15.50
s12	3.33	12.17	15.50
s4*	2.00	13.50	15.50
NM*	5.83	9.50	15.33
CN*	0.50	14.83	15.33
s6*	-1.33	16.50	15.17
s9	2.83	11.83	14.67
Fr*	1.67	12.67	14.33
AB*	0.67	13.17	13.83
s1*	2.50	11.00	13.50
ED*	5.33	8.00	13.33
s3*	-0.50	13.83	13.33
s8	2.00	11.33	13.33
s5	3.00	10.33	13.33
s1	0.33	12.83	13.17
s2	0.00	13.17	13.17
HS	-0.17	13.17	13.00
CH	0.67	11.83	12.50
FR	1.00	11.50	12.50
s11*	1.00	11.33	12.33
SC	1.33	10.67	12.00
KL	-1.17	11.50	10.33
MR*	0.83	7.33	8.17

Table No.11 -- Thirty Soldiers Ranked by CNEGB Scores
(* = Decorated)

Name	CPCNB	CNEGB	CPOSB
MR*	0.83	7.33	8.17
ED*	5.33	8.00	13.33
NM*	5.83	9.50	15.33
s5	3.00	10.33	13.33
SC	1.33	10.67	12.00
s16*	2.50	11.00	13.50
s7	4.67	11.00	15.67
s11*	1.00	11.33	12.33
s8	2.00	11.33	13.33
FR	1.00	11.50	12.50
KL	-1.17	11.50	10.33
s14*	3.67	11.83	15.50
CH	0.67	11.83	12.50
s9	2.83	11.83	14.67
s12	3.33	12.17	15.50
s13	3.83	12.50	16.33
Fr*	1.67	12.67	14.33
s1	0.33	12.83	13.17
s10*	5.00	13.00	18.00
HS	-0.17	13.17	13.00
AB*	0.67	13.17	13.83
s2	0.00	13.17	13.17
Fa	3.33	13.50	16.83
s4*	2.00	13.50	15.50
s3*	-0.50	13.83	13.33
s15*	1.83	14.50	16.33
CN*	0.50	14.83	15.33
BR*	1.00	15.50	16.50
s6*	-1.33	16.50	15.17

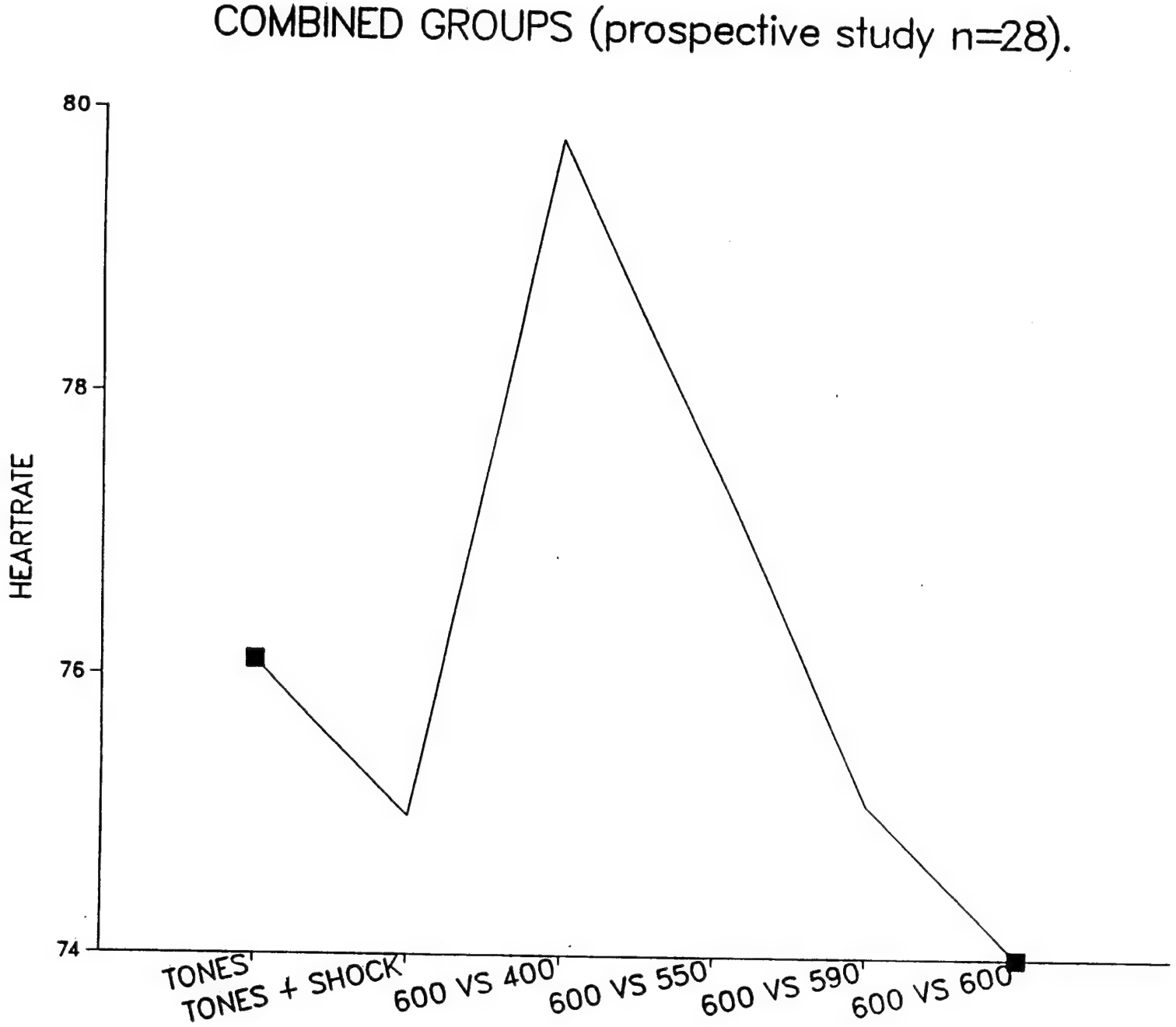

COMBINED GROUPS (prospective study n=28).
80
78
76
74
HEARTRATE
TONES'
TONES + SHOCK'
600 VS 400'
600 VS 550'
600 VS 590'
600 VS 600'

Fig. I a

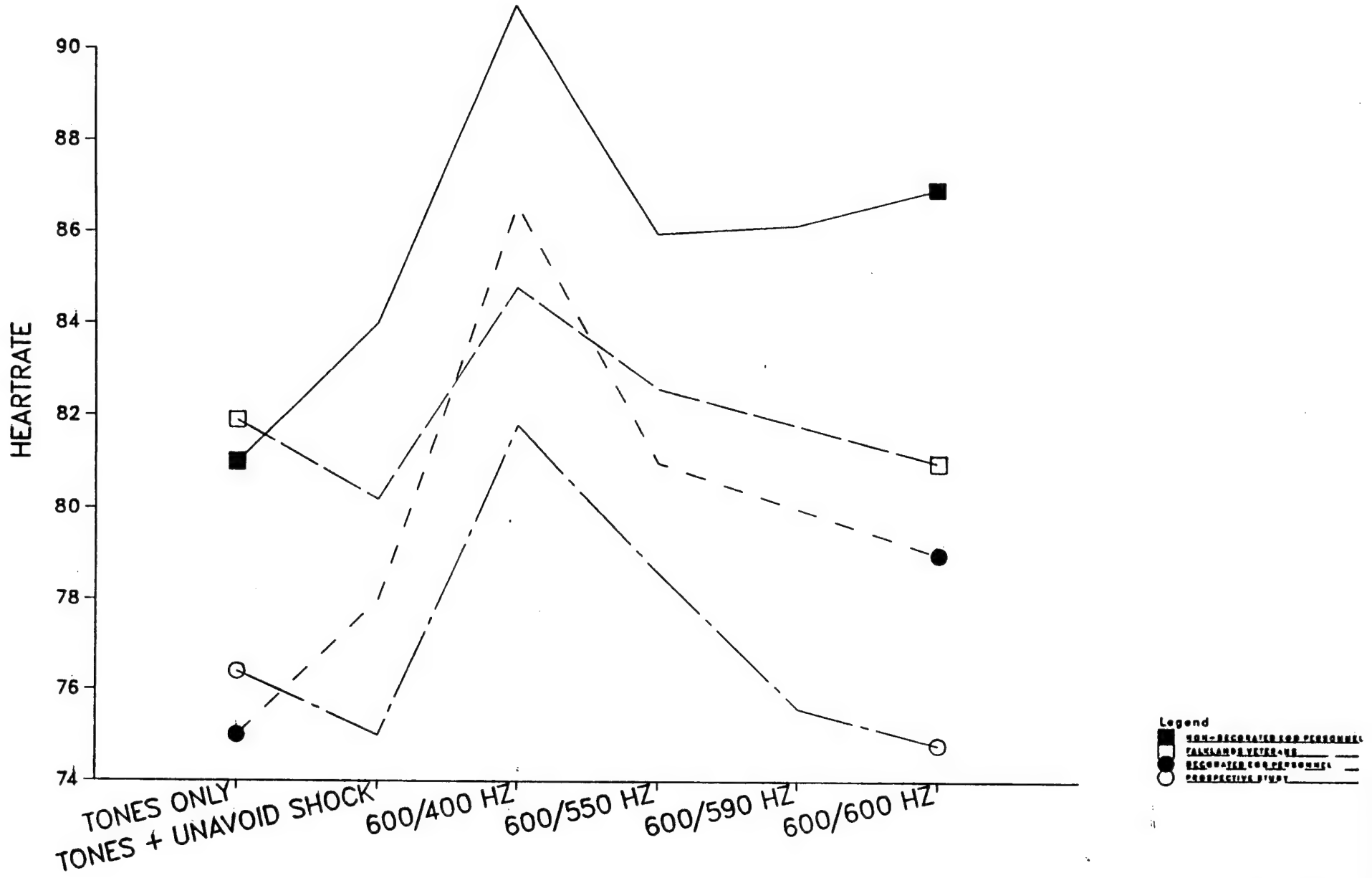

HEARTRATE
90
88
86
84
82
80
78
76
74
TONES ONLY
TONES + UNAVOID SHOCK
600/400 HZ
600/550 HZ
600/590 HZ
600/600 HZ
Legend

Fig. I b

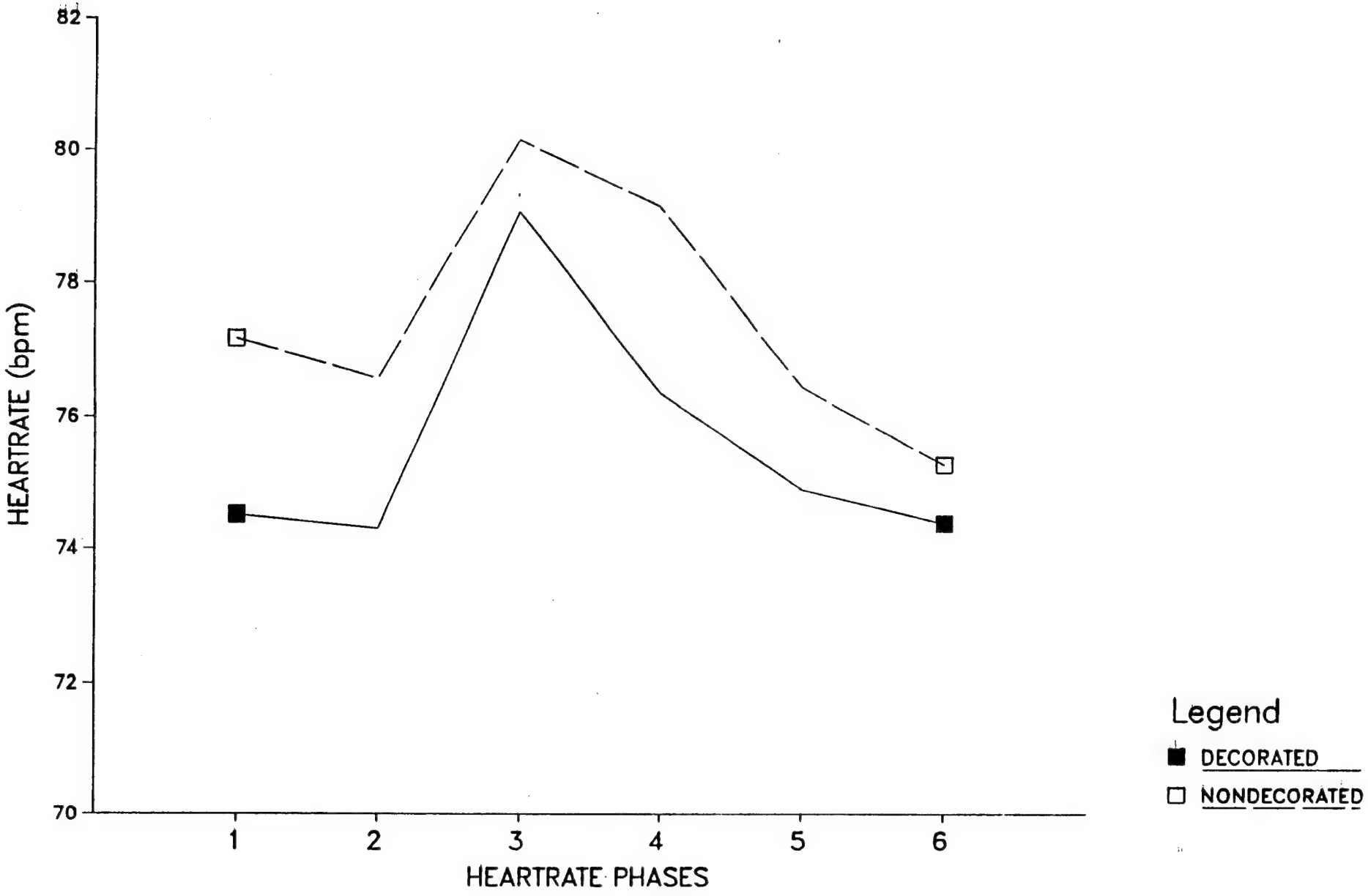

82
80
78
76
74
72
70
HEARTRATE (bpm)
1
2
3
4
5
6
HEARTRATE PHASES
Legend
DECORATED
NONDECORATED

Fig. I c

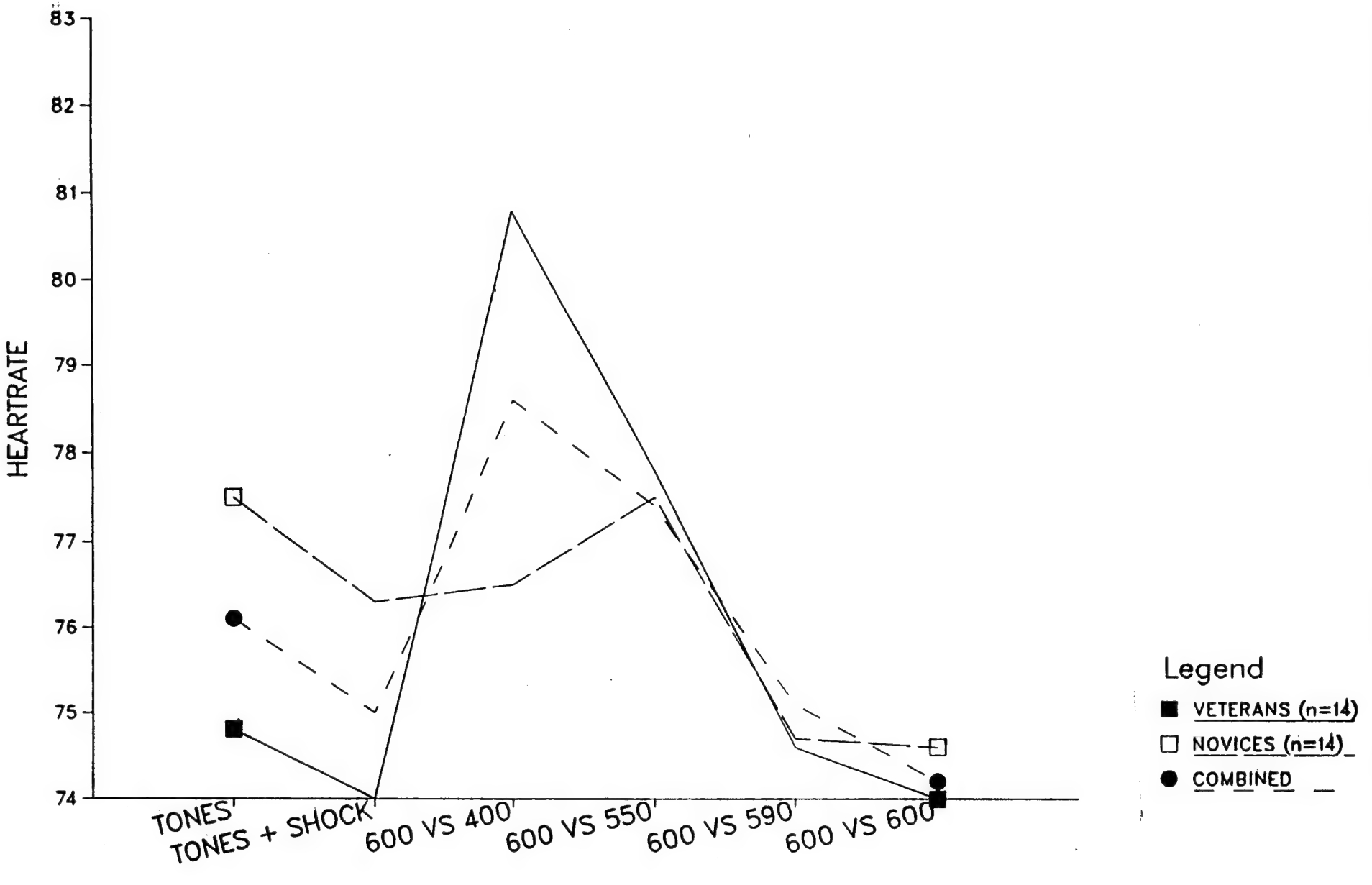

PROSPECTIVE STUDY (vets vs novices)
HEARTRATE
83
82
81
80
79
78
77
76
75
74
TONES
TONES + SHOCK
600 VS 400
600 VS 550
600 VS 590
600 VS 600
Legend
VETERANS (n=14)
NOVICES (n=14)
COMBINED

Fig. I d

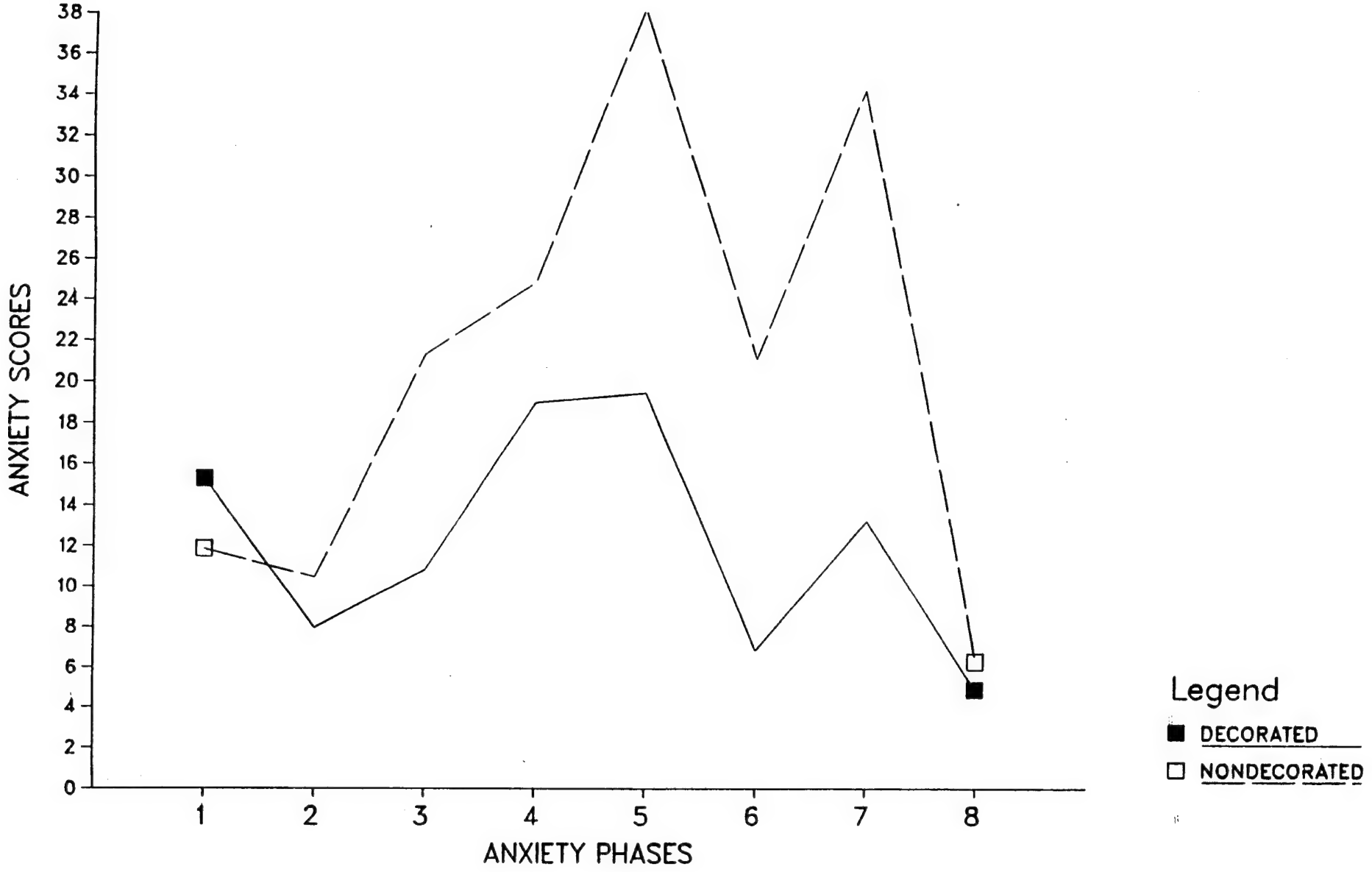

ANXIETY SCORES
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
ANXIETY PHASES
Legend
DECORATED
NONDECORATED

Fig. II a

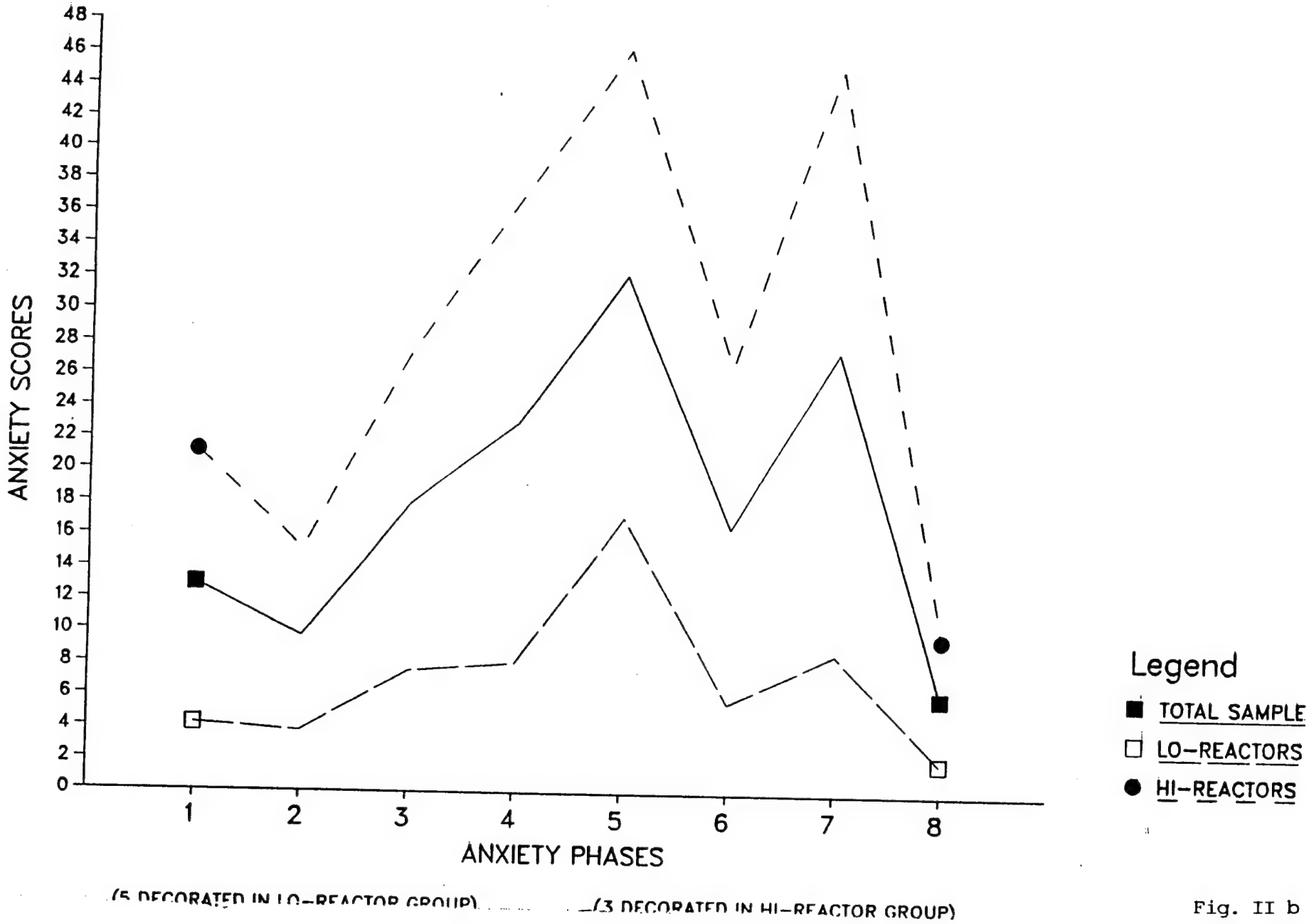

ANXIETY SCORES
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
ANXIETY PHASES
Legend
TOTAL SAMPLE
LO-REACTORS
HI-REACTORS
(5 DECORATED IN LO-REACTOR GROUP)
(3 DECORATED IN HI-REACTOR GROUP)

Fig. II b

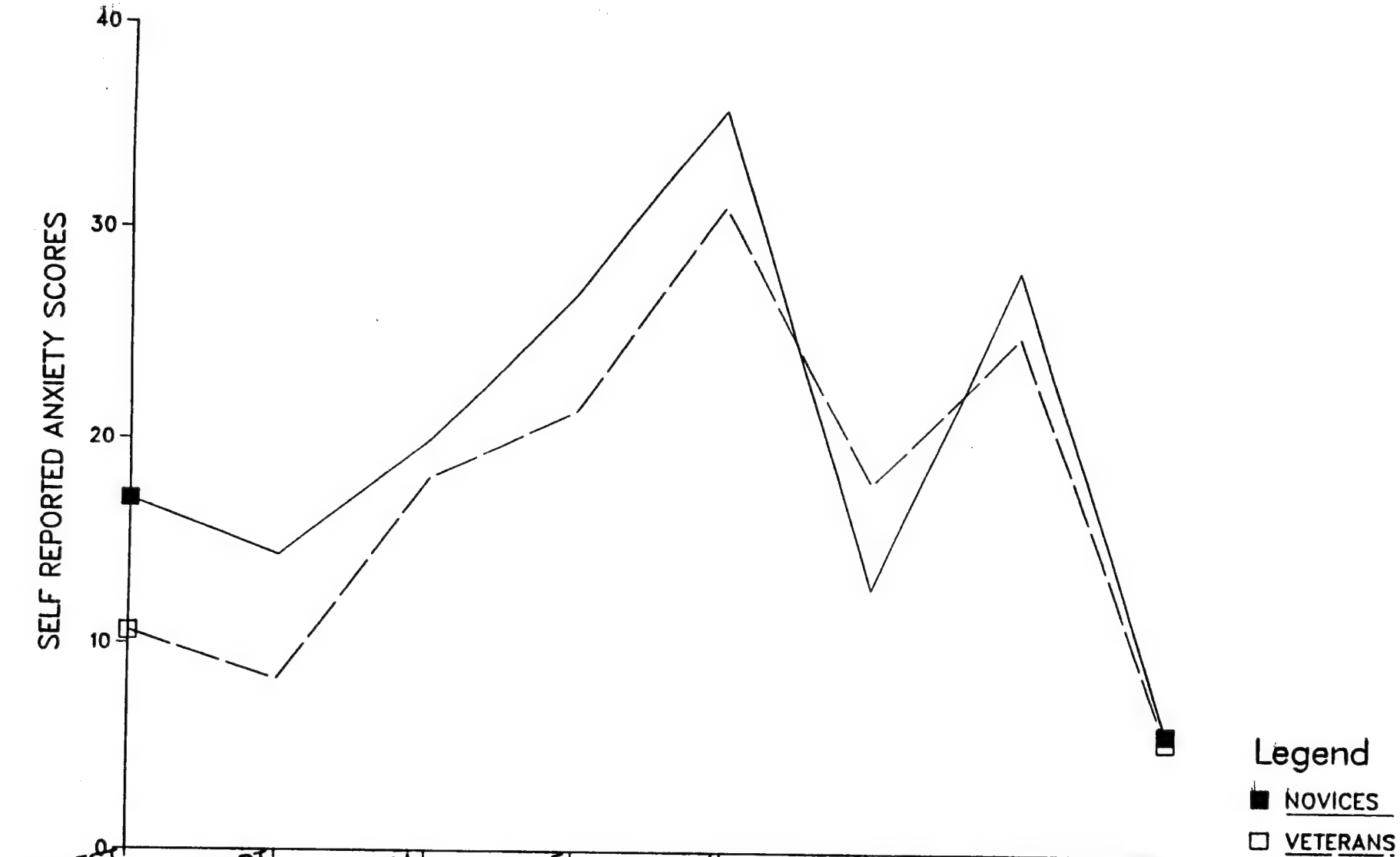

SELF REPORTED ANXIETY SCORES
40
30
20
10
0
REQUEST
APPT
EARLIER A.M.
JUST BEFORE
UNAVOID SHOCK
AVOID SHOCK
UNSOLV SHOCK
JUST AFT TEST
Legend
NOVICES
VETERANS

Fig. II c

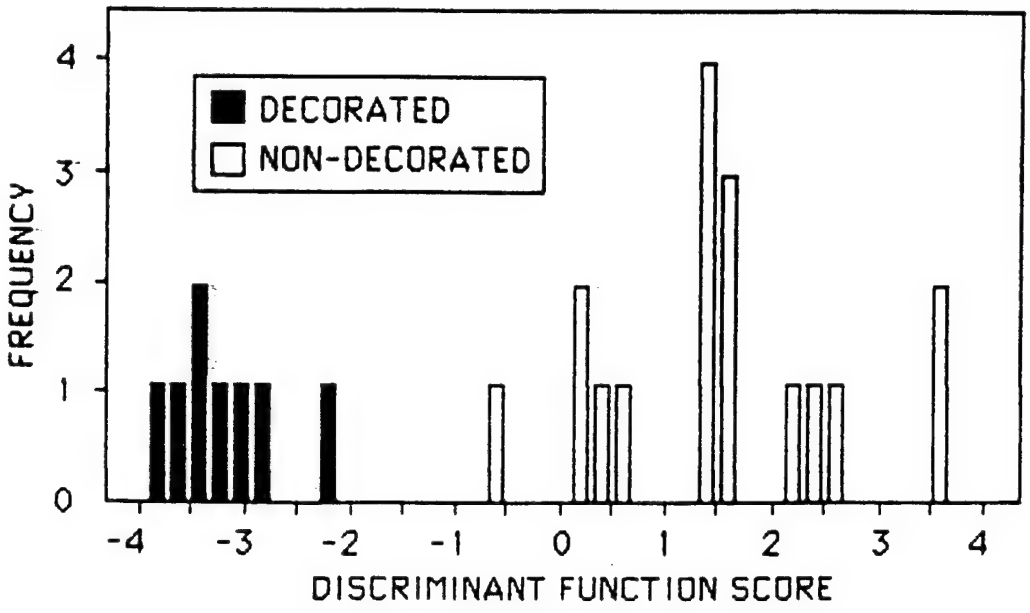
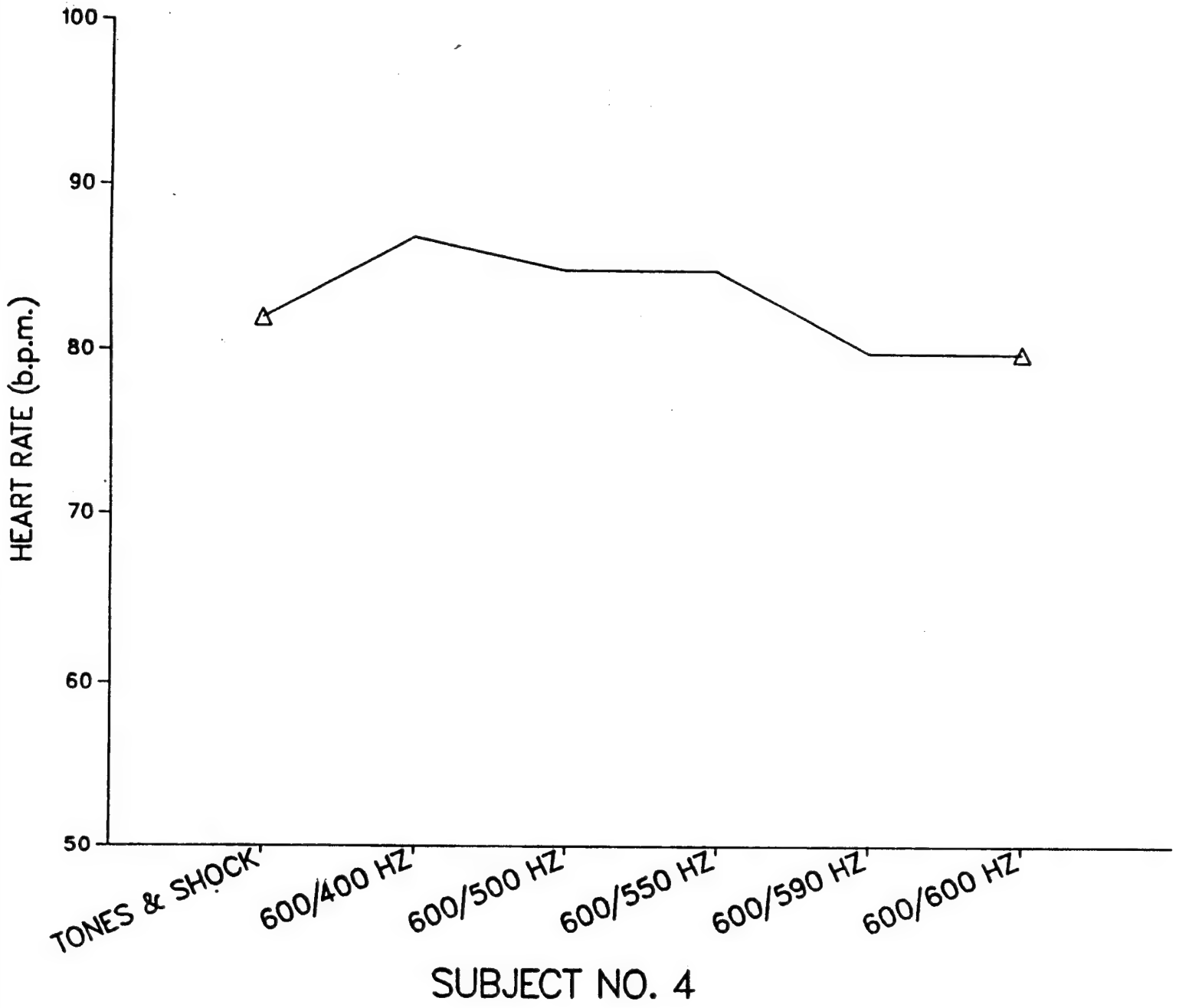


Figure III Frequency distributions (number of subjects) of decorated and non-decorated subjects on the first discriminant function.

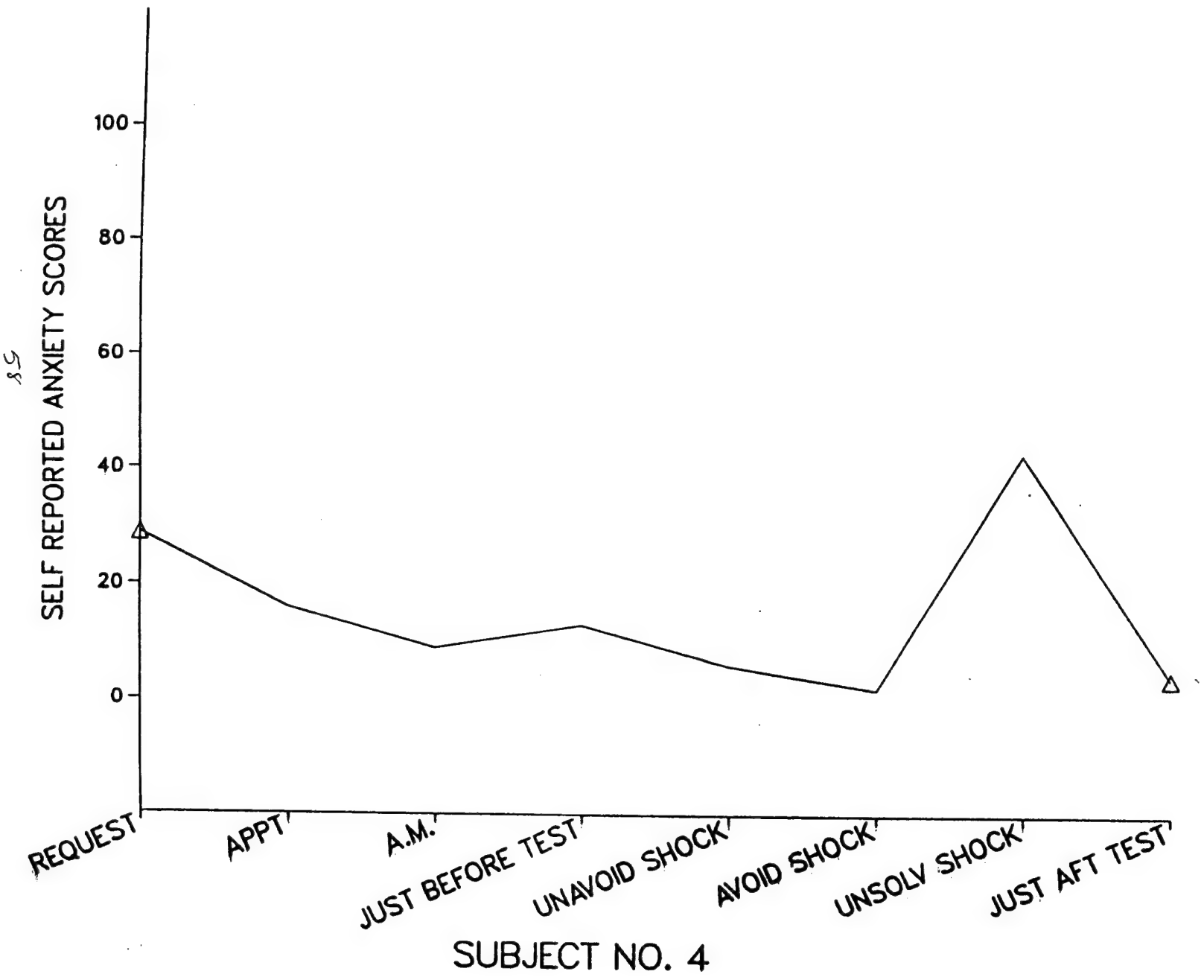
Fig. IV a



SUBJECT NO. 4

57

Fig. IV b



SUBJECT NO. 4

Fig. V a

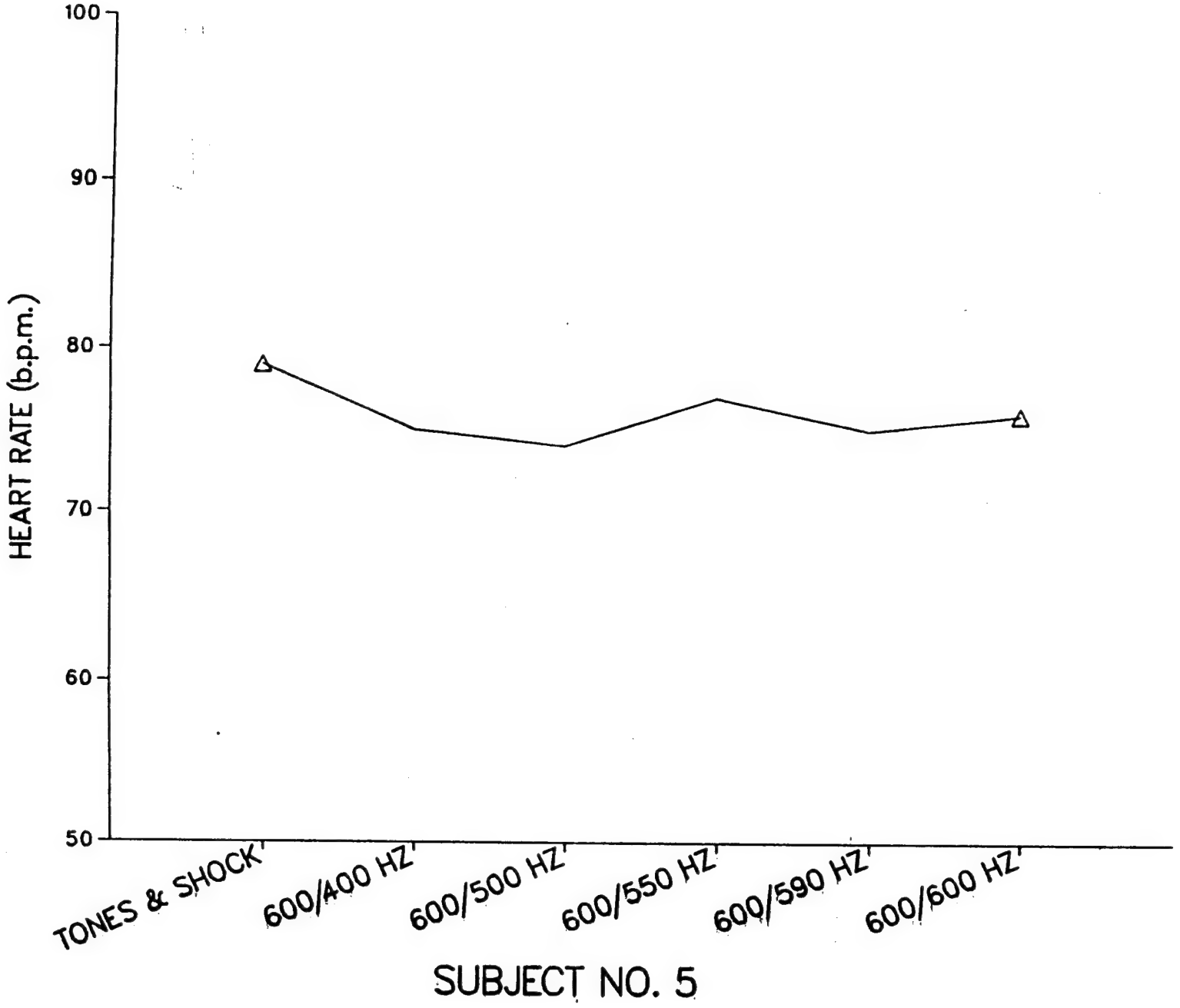
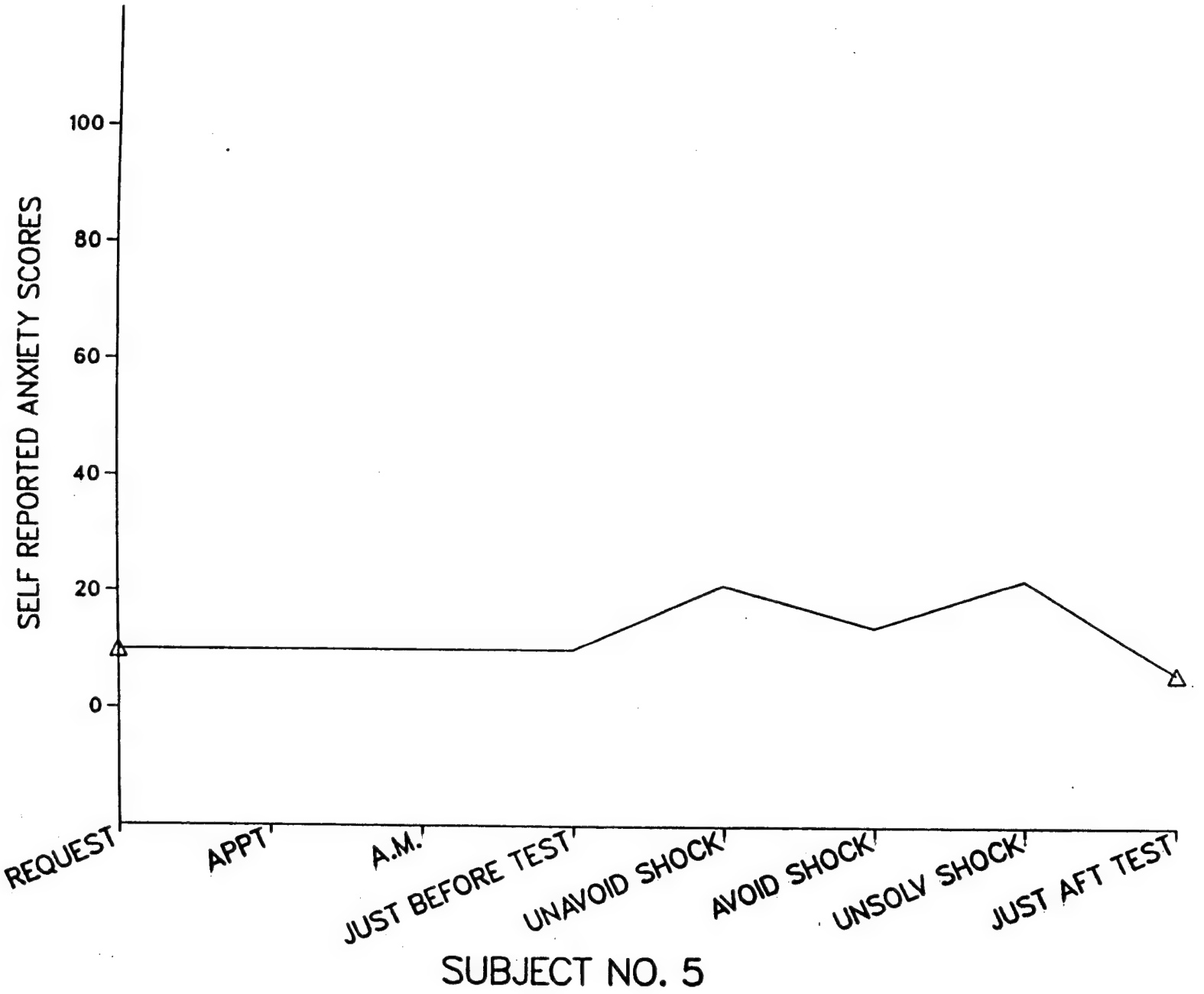

100
90
80
70
60
50
HEART RATE (b.p.m.)
TONES & SHOCK
600/400 HZ
600/500 HZ
600/550 HZ
600/590 HZ
600/600 HZ
SUBJECT NO. 5

Fig. V b



SUBJECT NO. 5

Fig. VI a

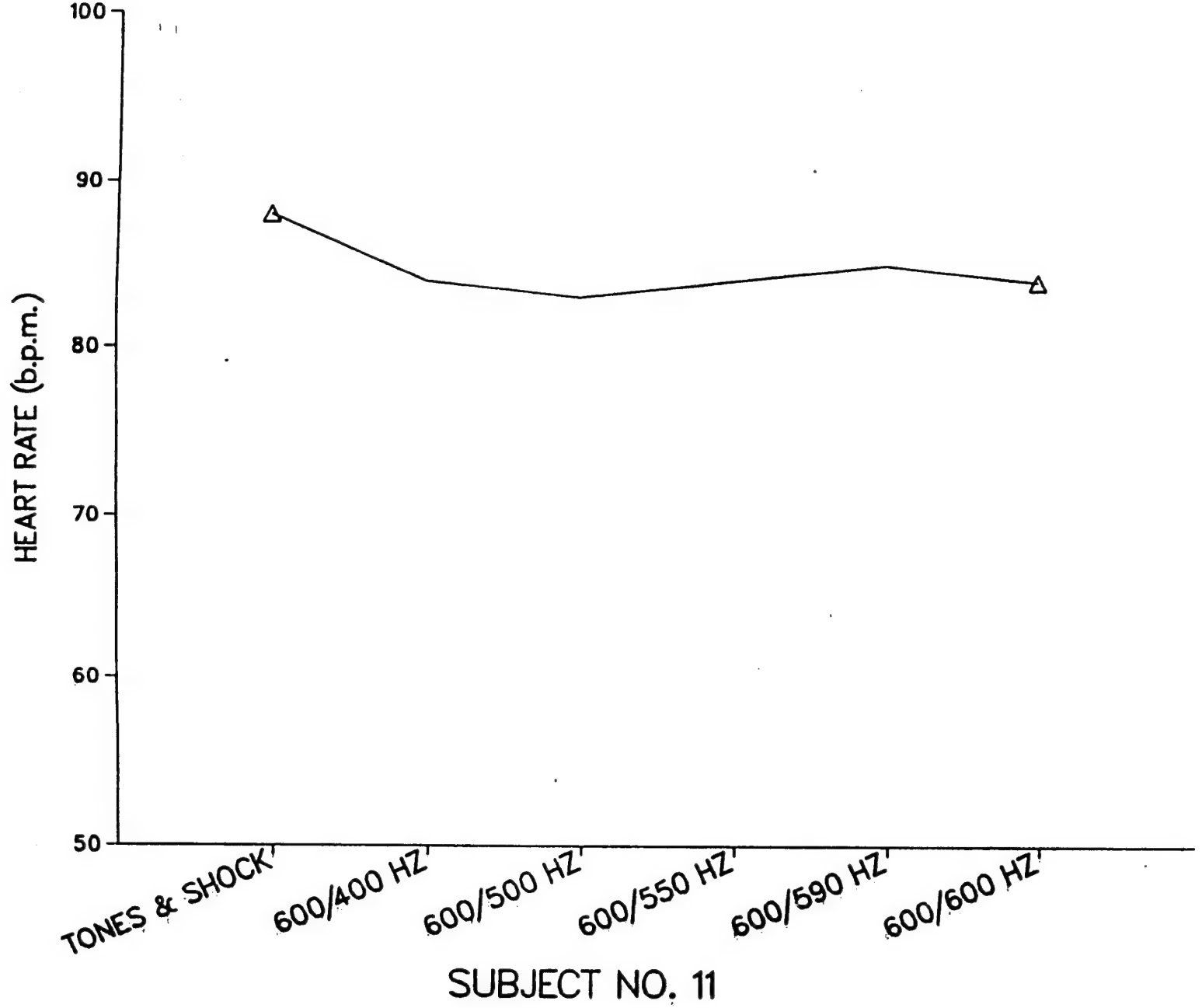
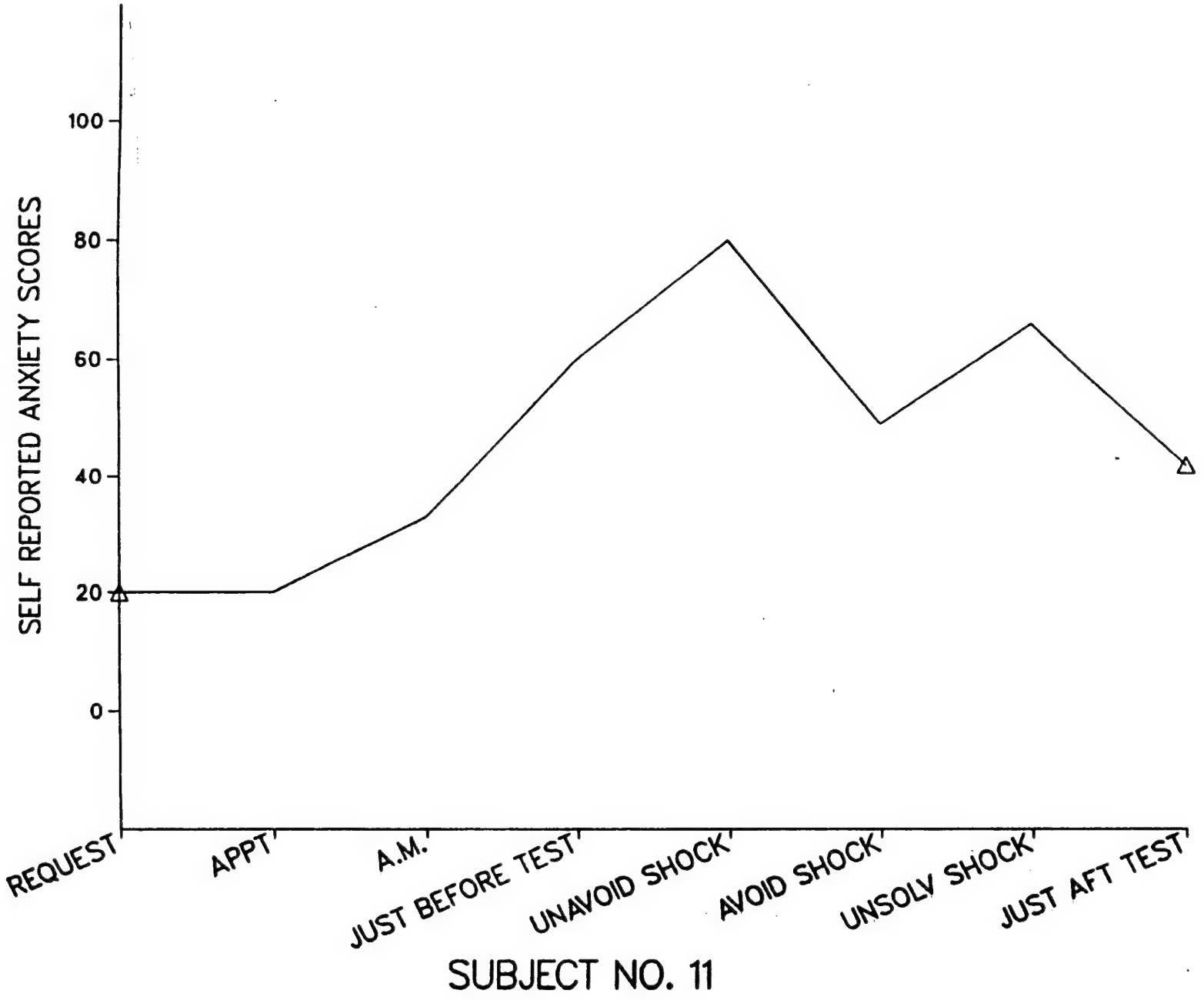

100
90
80
70
60
50
HEART RATE (b.p.m.)
TONES & SHOCK
600/400 HZ
600/500 HZ
600/550 HZ
600/590 HZ
600/600 HZ
SUBJECT NO. 11

Fig. VI b



SUBJECT NO. 11

Fig. VII a

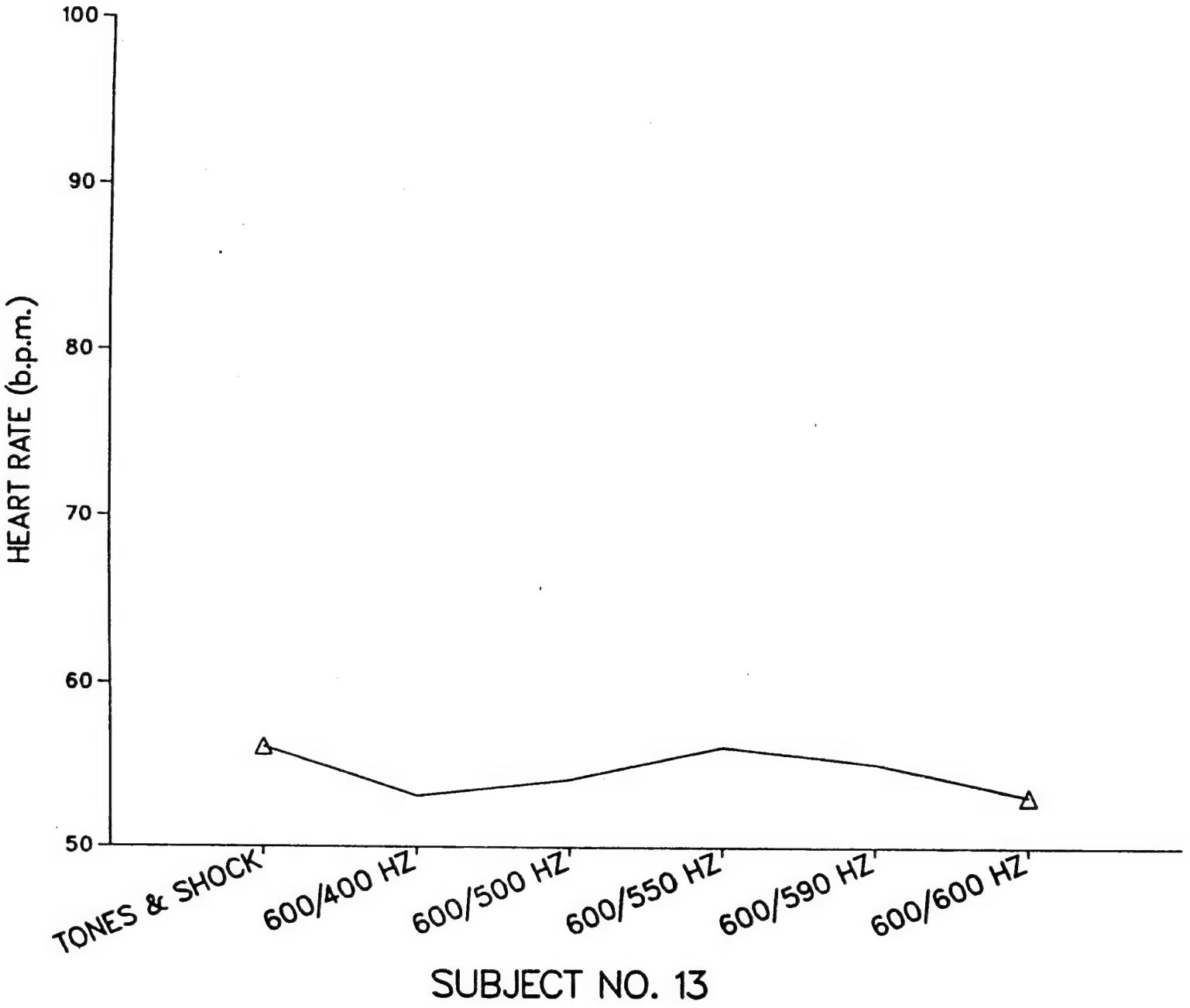
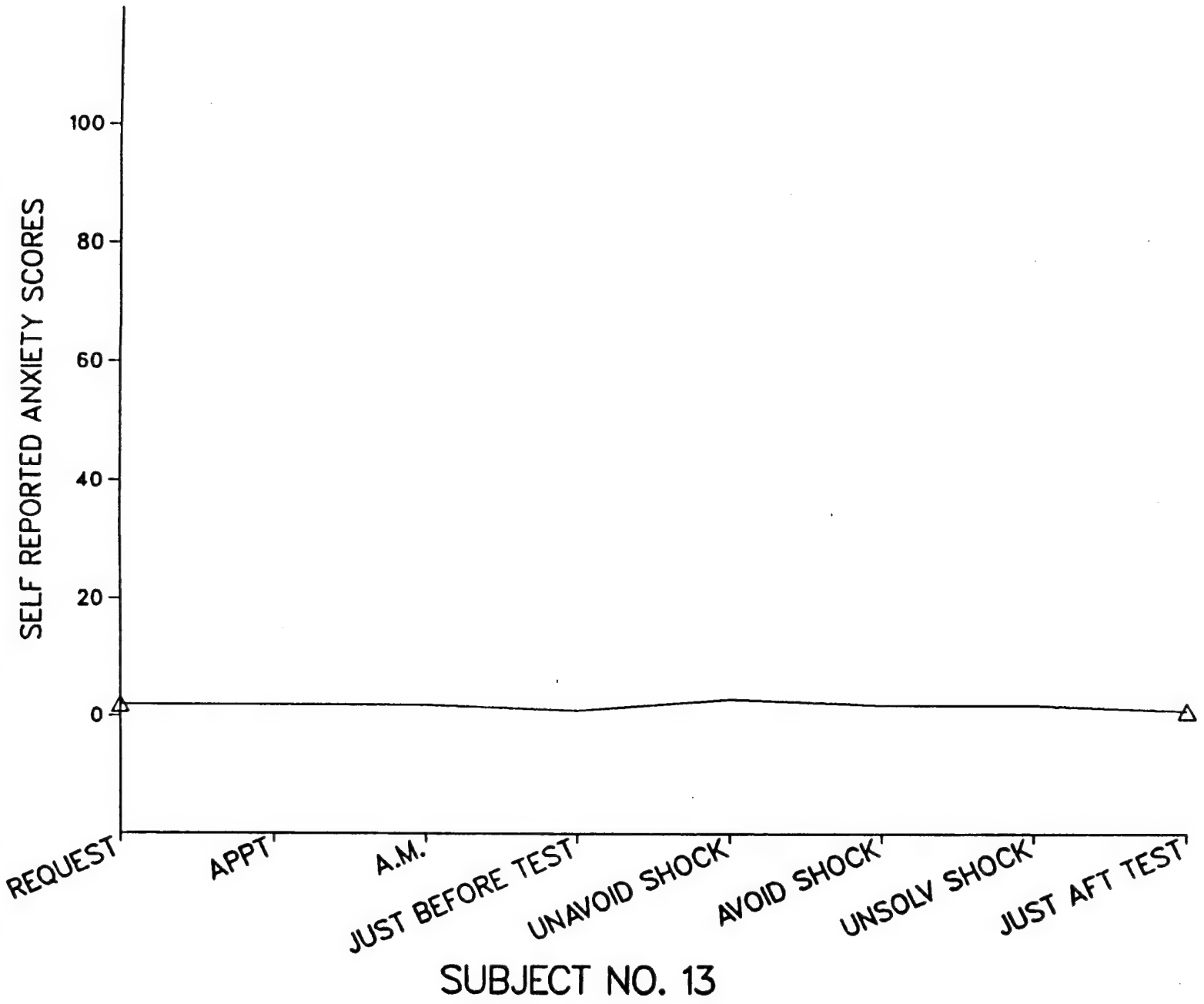

100
90
80
70
60
50
HEART RATE (b.p.m.)
TONES & SHOCK
600/400 HZ
600/500 HZ
600/550 HZ
600/590 HZ
600/600 HZ
SUBJECT NO. 13

Fig. VII b



SUBJECT NO. 13

Fig. VIII a

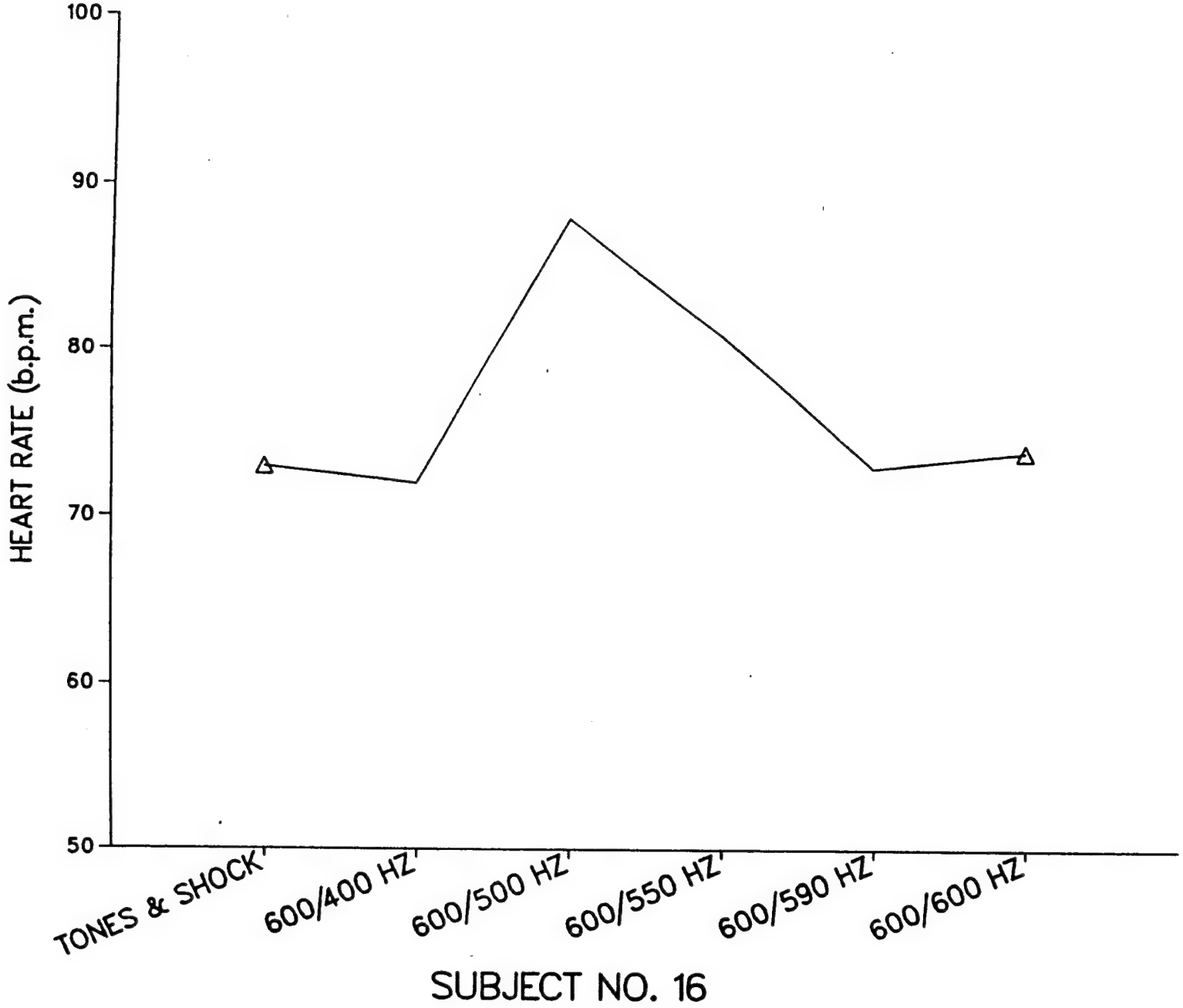

100
90
80
70
60
50
HEART RATE (b.p.m.)
TONES & SHOCK'
600/400 HZ'
600/500 HZ'
600/550 HZ'
600/590 HZ'
600/600 HZ'
SUBJECT NO. 16

Fig. VIII b

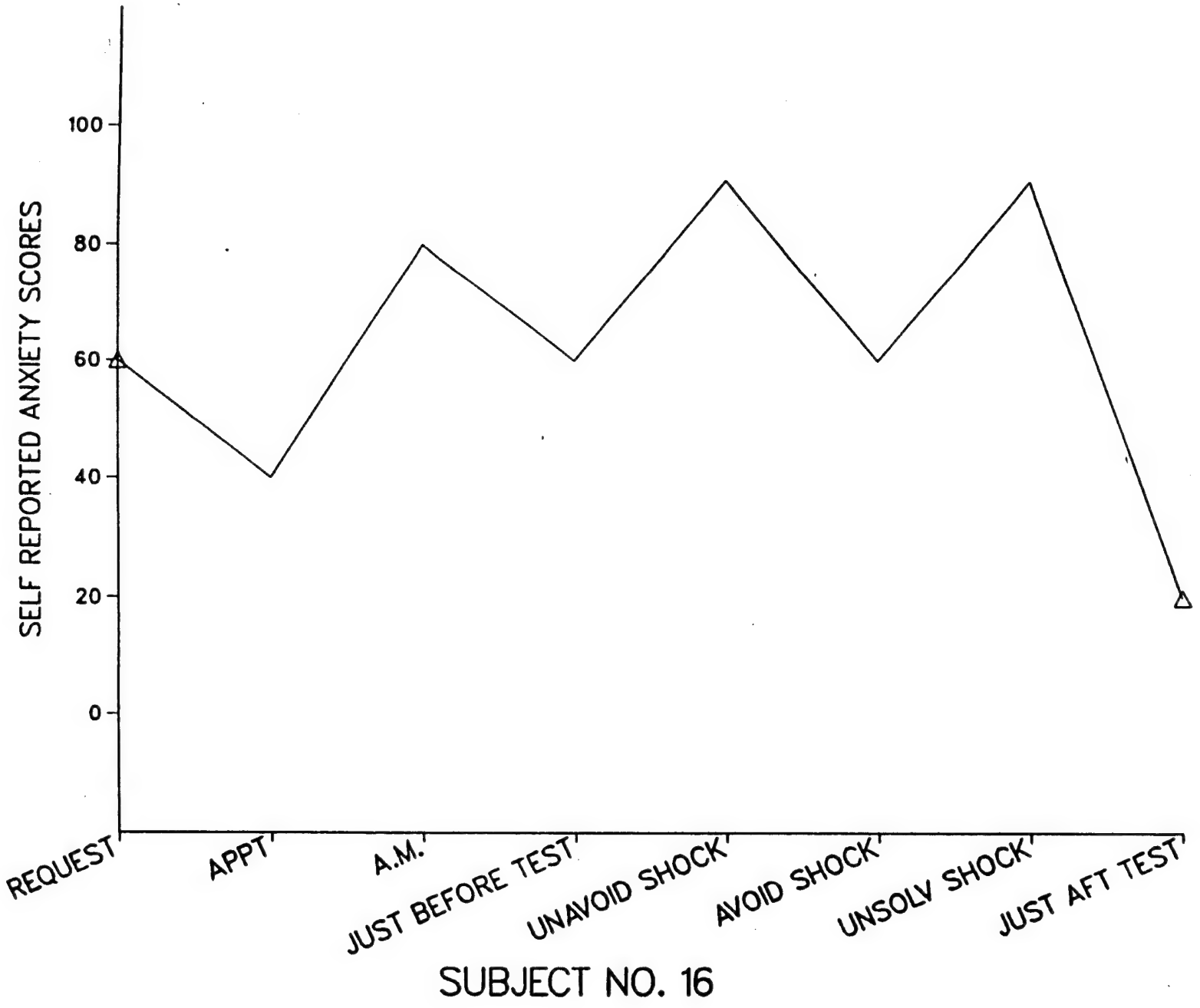

SELF REPORTED ANXIETY SCORES
100
80
60
40
20
0
REQUEST
APPT
A.M.
JUST BEFORE TEST
UNAVOID SHOCK
AVOID SHOCK
UNSOLV SHOCK
JUST AFT TEST
SUBJECT NO. 16

Fig. IX á

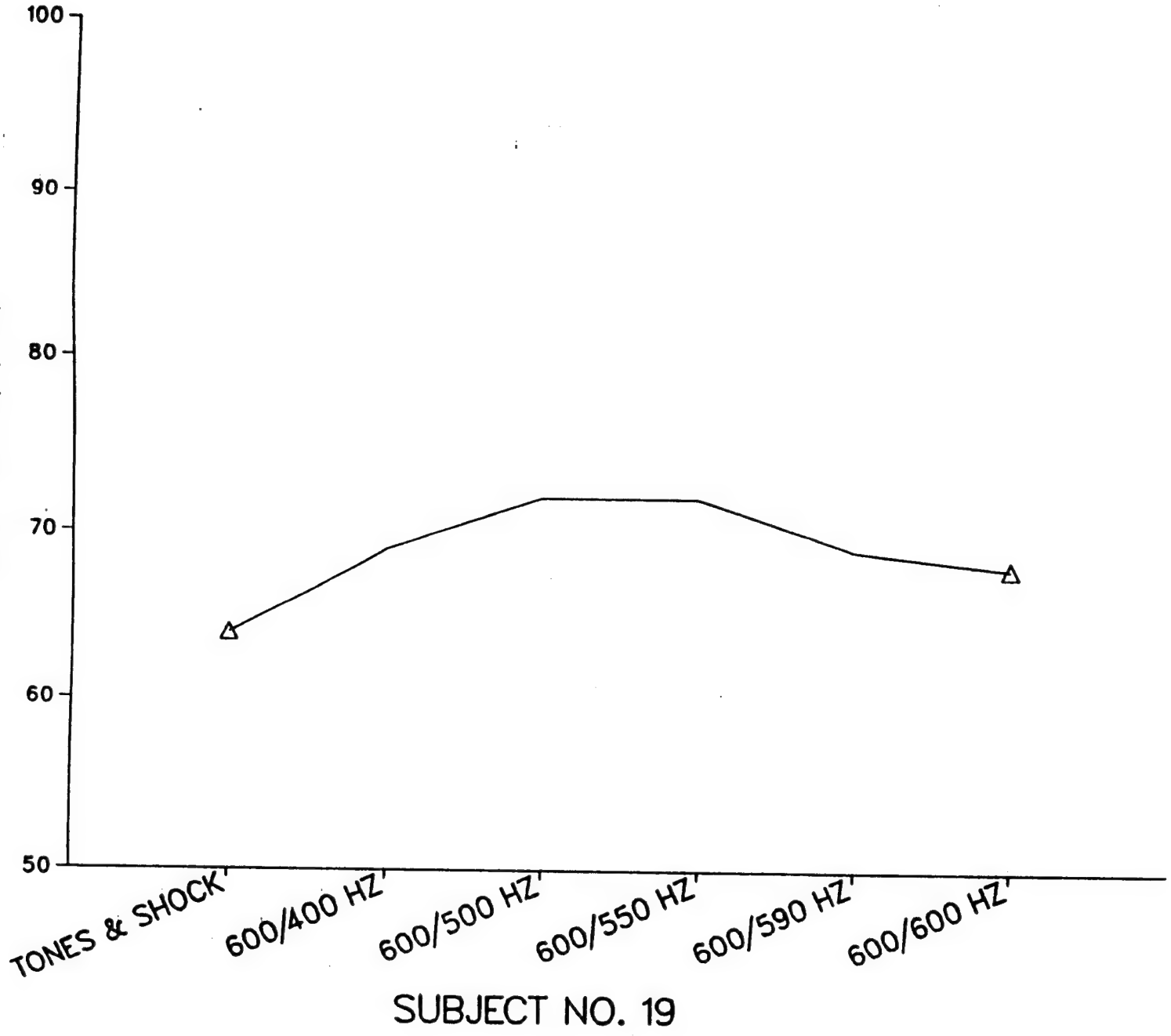
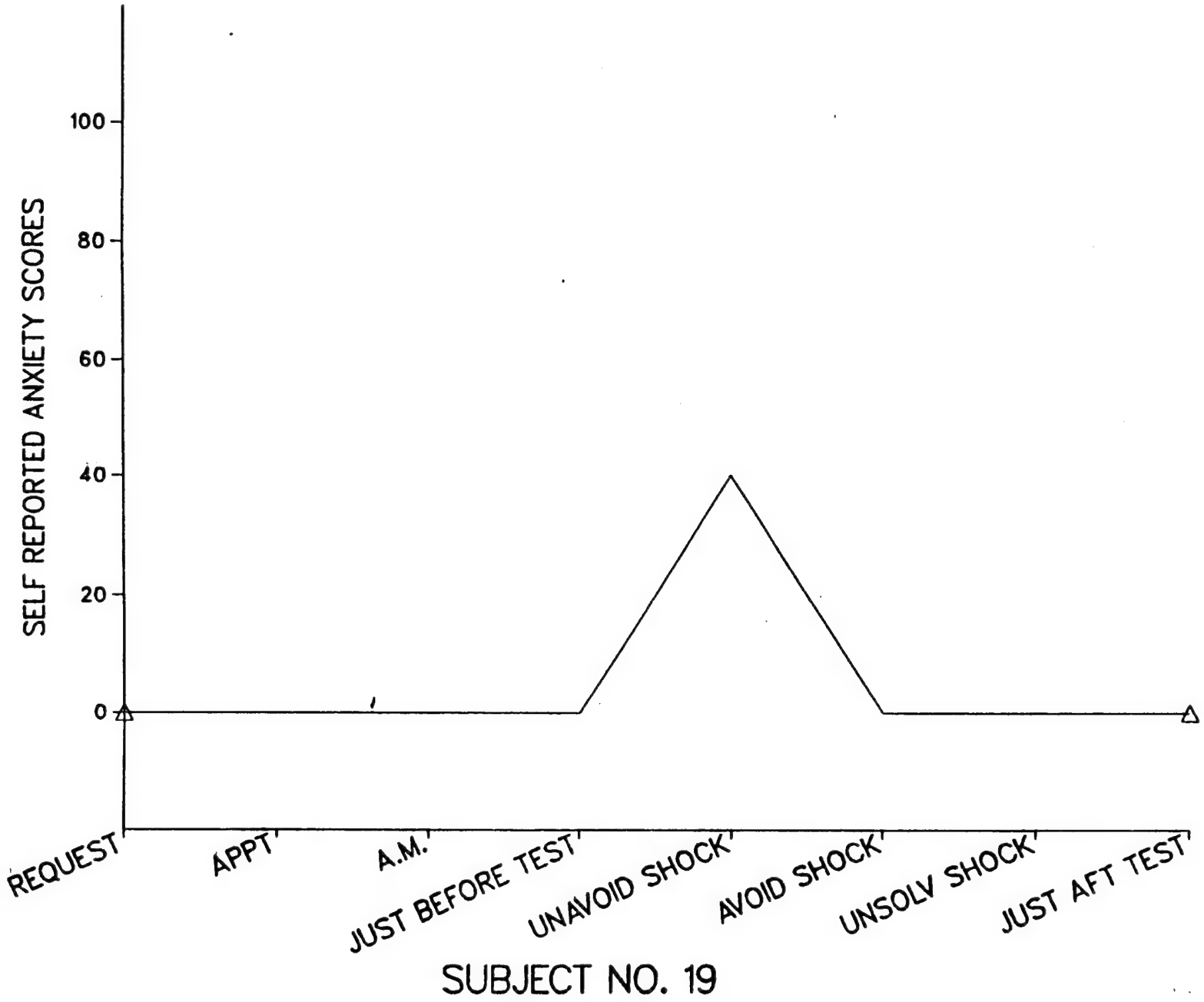
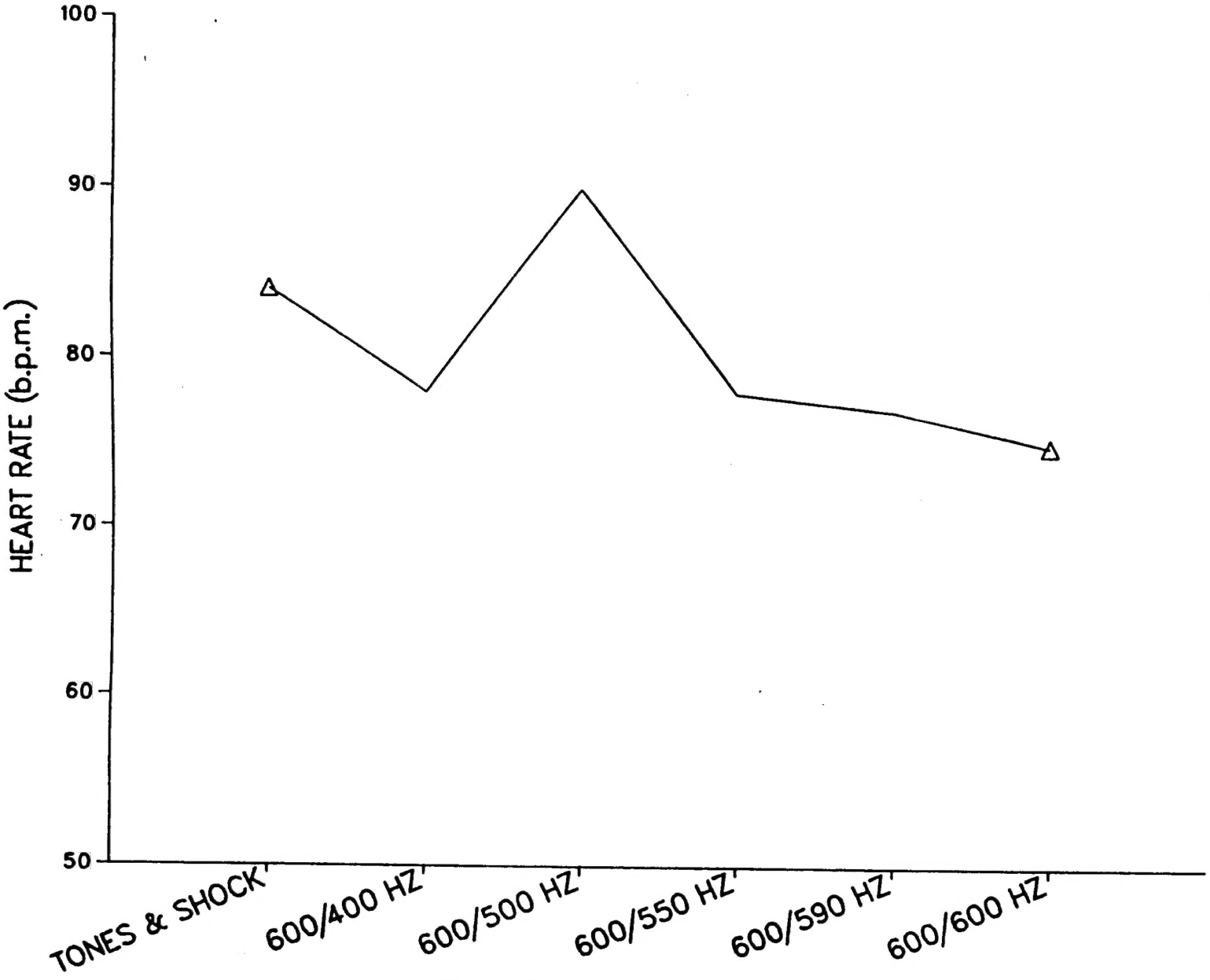

100
90
80
70
60
50
HEART RATE (b.p.m.)
TONES & SHOCK
600/400 HZ
600/500 HZ
600/550 HZ
600/590 HZ
600/600 HZ
SUBJECT NO. 19

Fig. IX b



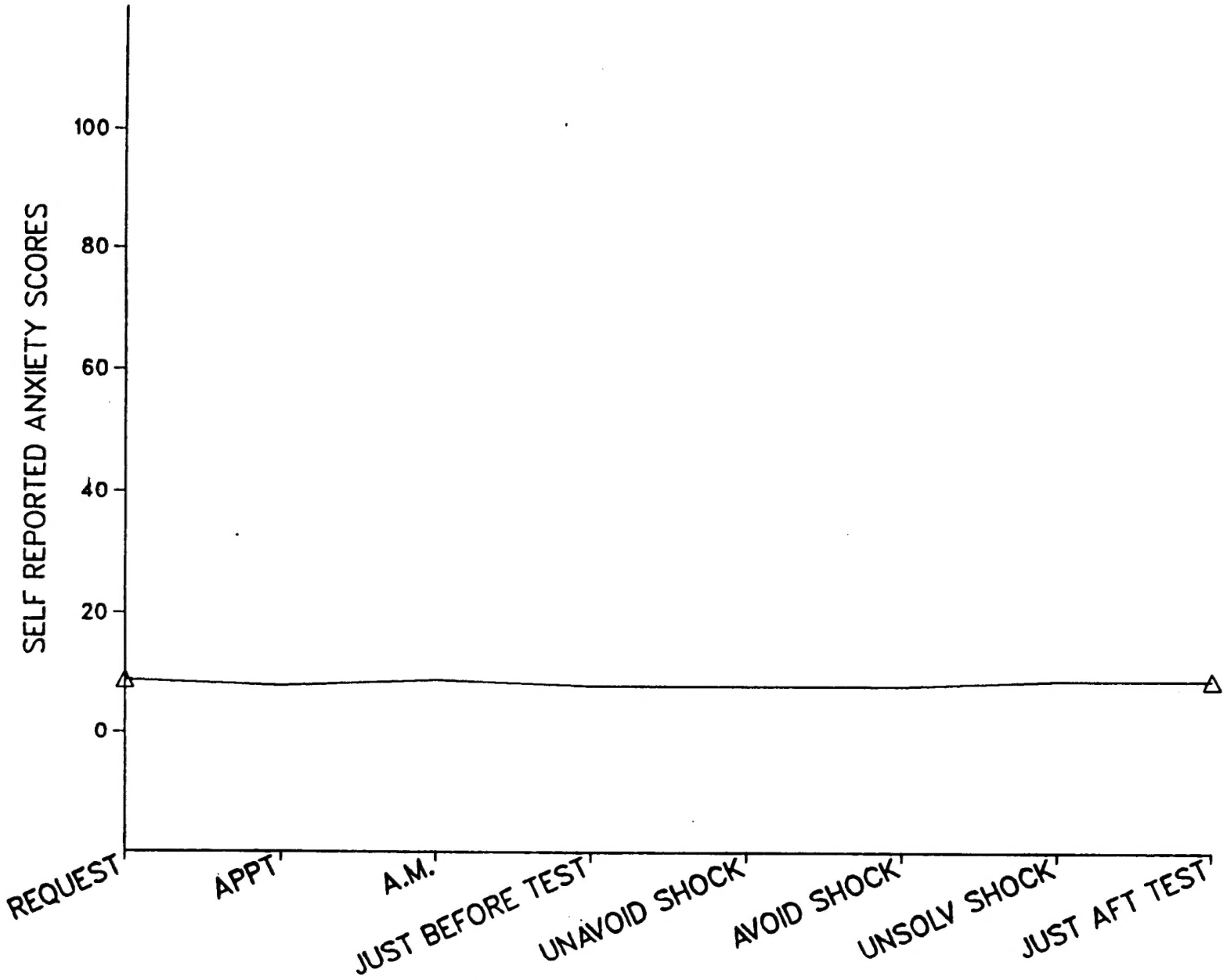
SUBJECT NO. 19

Fig. X a



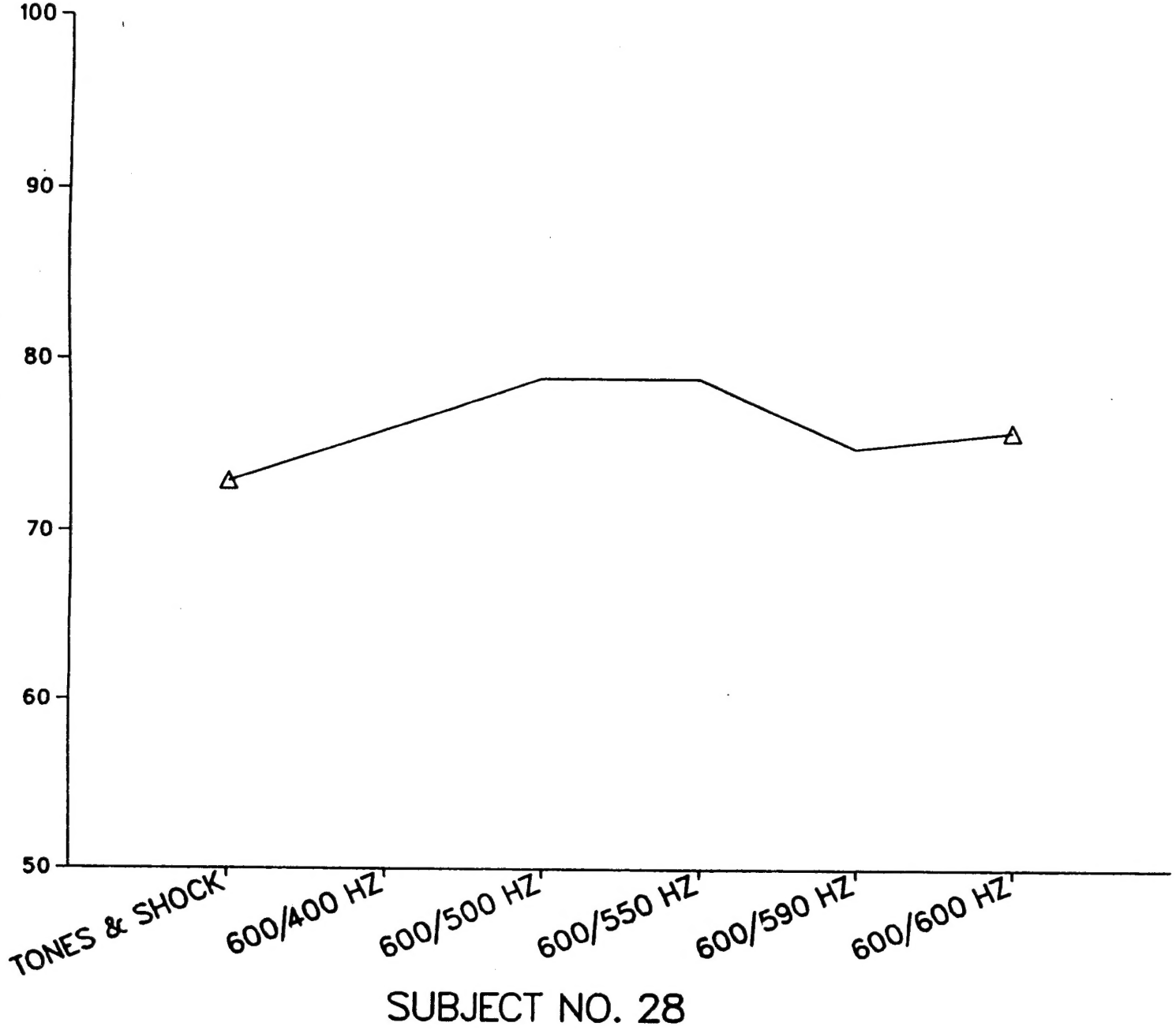
SUBJECT NO. 24

Fig. X b'



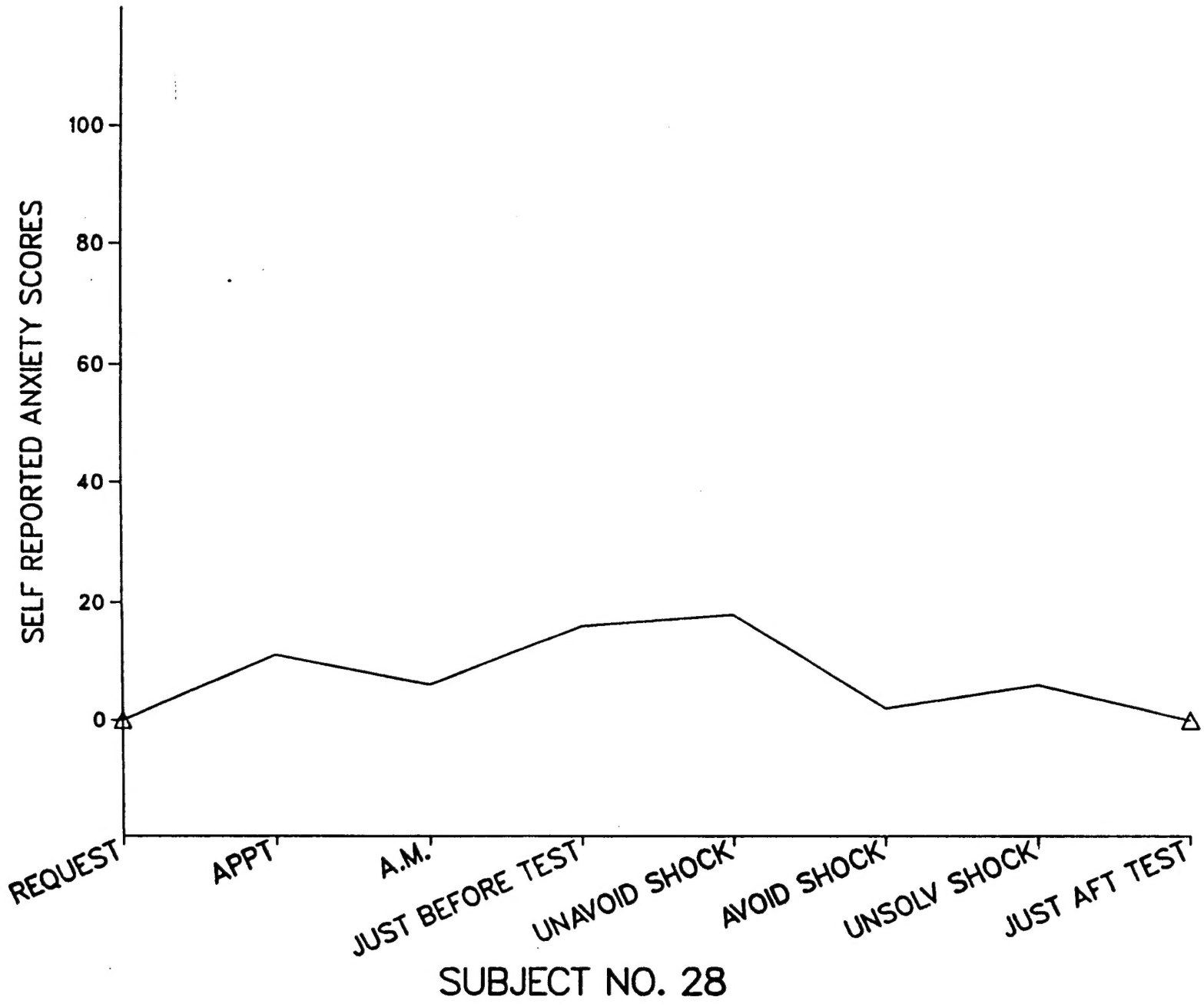
SUBJECT NO. 24

Fig. XI a



SUBJECT NO. 28

Fig. XI b


SELF REPORTED ANXIETY SCORES
100
80
60
40
20
0
REQUEST
APPT
A.M.
JUST BEFORE TEST
UNAVOID SHOCK
AVOID SHOCK
UNSOLV SHOCK
JUST AFT TEST
SUBJECT NO. 28